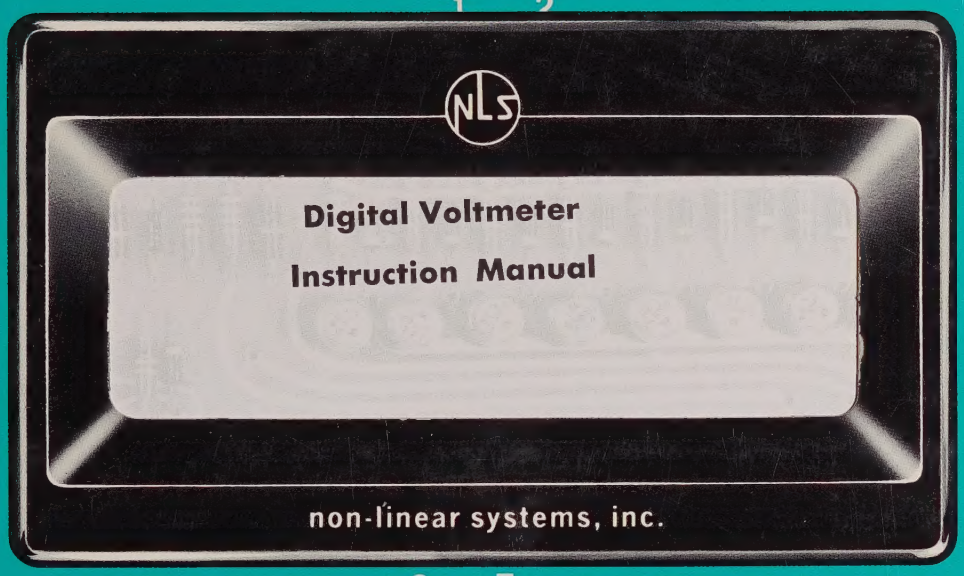


non | linear
systems, inc.

DEL MAR, CALIFORNIA

# Models V35B and V35RB

# Digital Voltmeter

# Instruction Manual

## Part 2

### Notes:

1. The V35B Digital Voltmeter Instruction Manual is in two parts. Part 1, supplied in the front cover envelope of Part 2, contains text relating to the figures, tables, schematics and parts list data of Part 2.
2. The *Appendix* contains additional V35RB information.

**This manual is for instrument Serial No._____**

Non-Linear Systems, Inc.
Del Mar, California

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*V35B/V35RB; Revised, 500; Jan. 1963*

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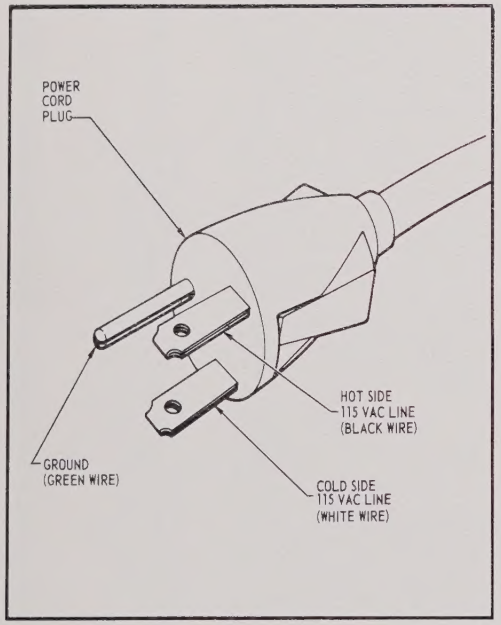



*Figure 1. Power Plug Pin Coding.*

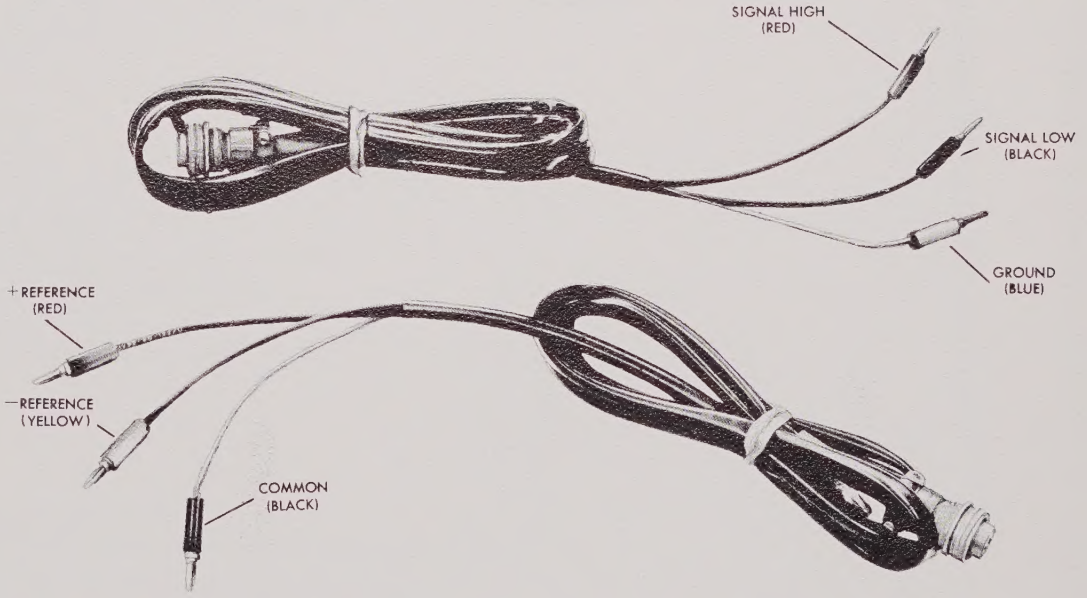



*Figure 2. V35B Cables. Top: Signal Input. Bottom: External Reference Supply.*

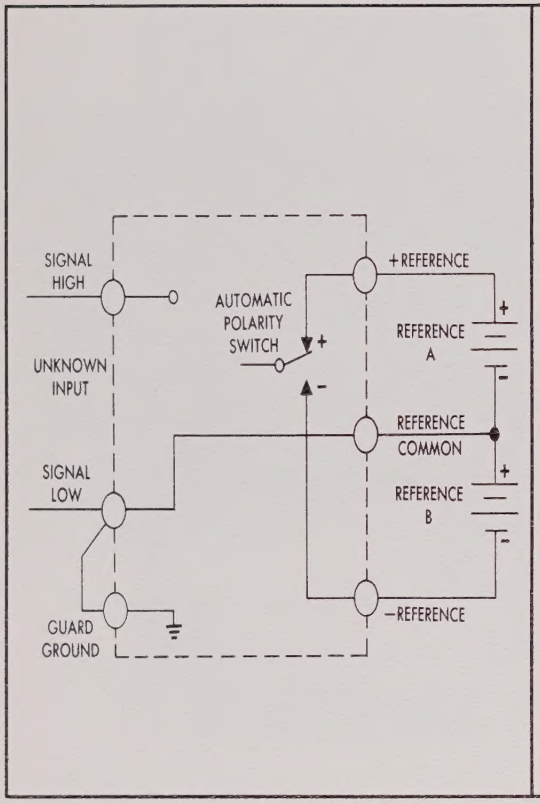



Figure 3. External Reference Supply Connection . . . To Measure Positive and Negative Input Voltages.

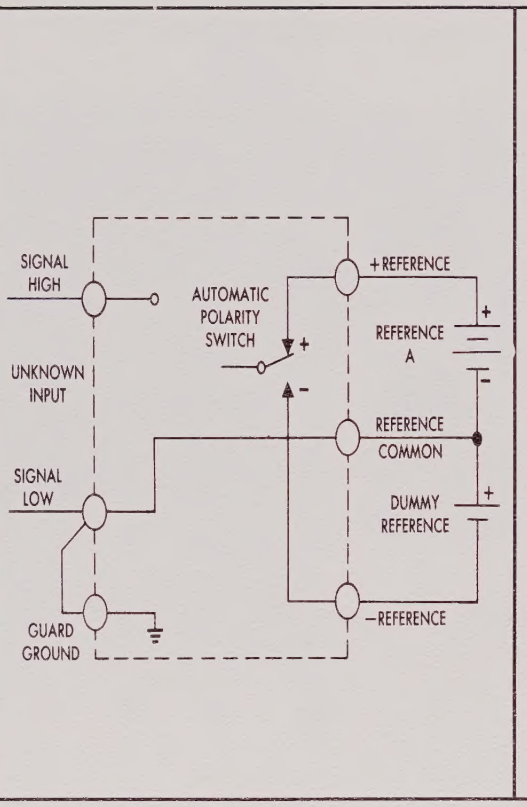



Figure 4. External Reference Supply Connection . . . To Measure Input Voltages of a Single Circuit.

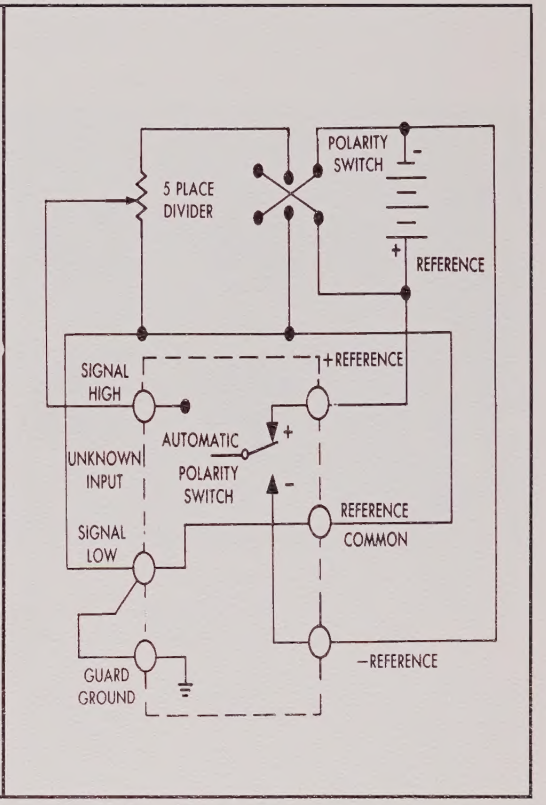



Figure 5. Ratiometer Linearity Test Circuit.

*Figure 6. Front Panel Controls.*

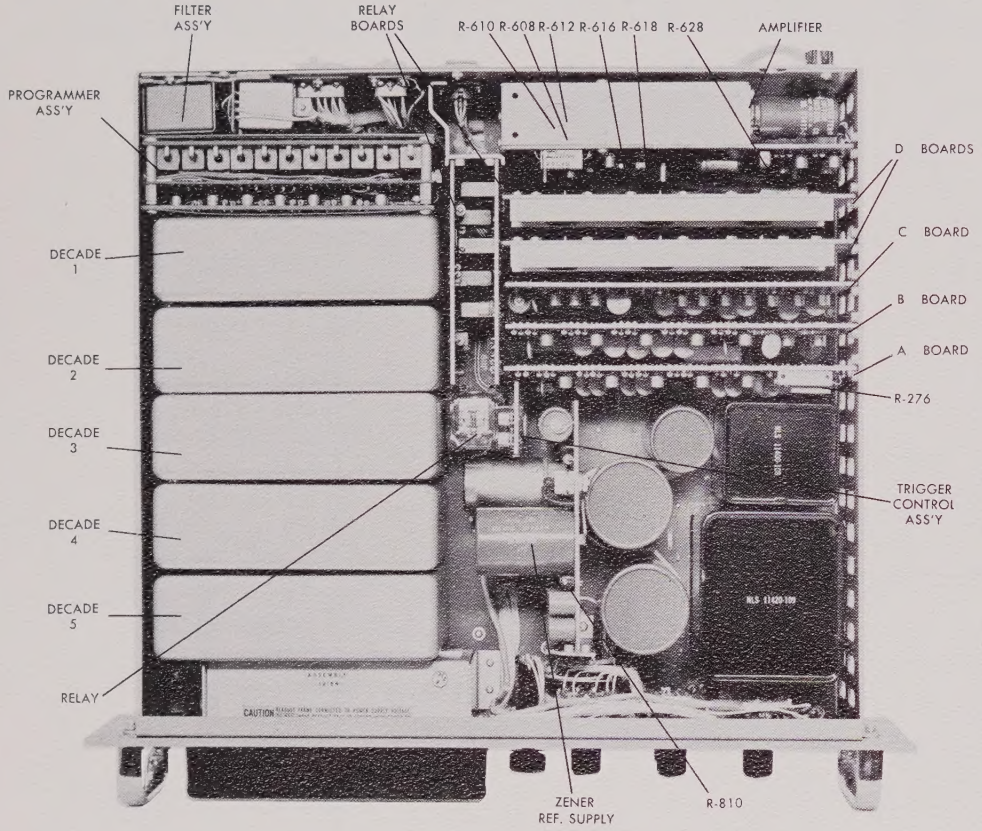



*Figure 7. Calibration Adjustment Points and Plug-in Component Identification.*

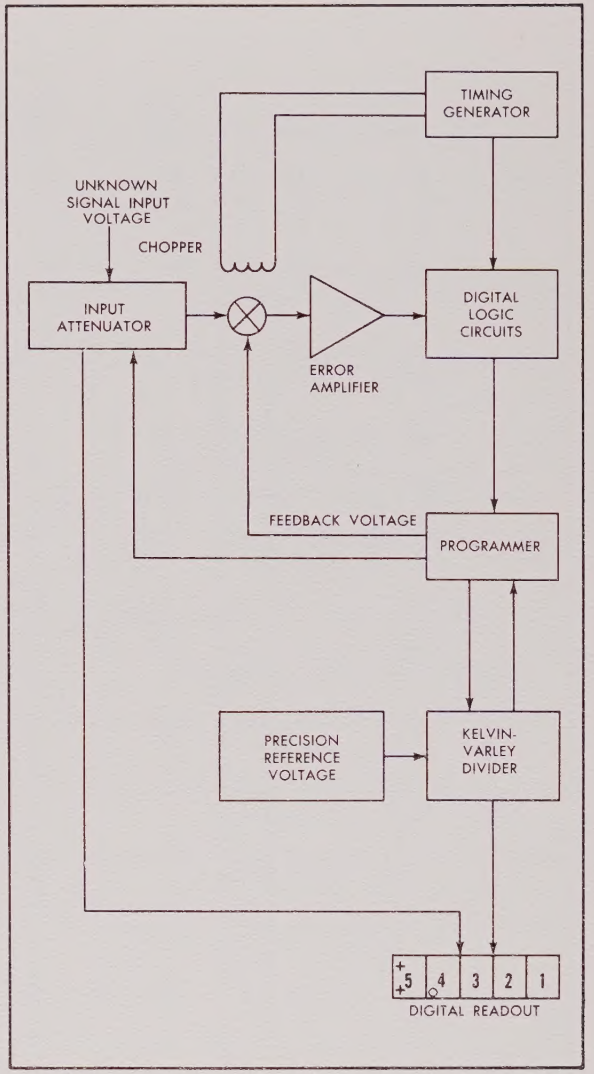



*Figure 8. Block Diagram of V35B.*

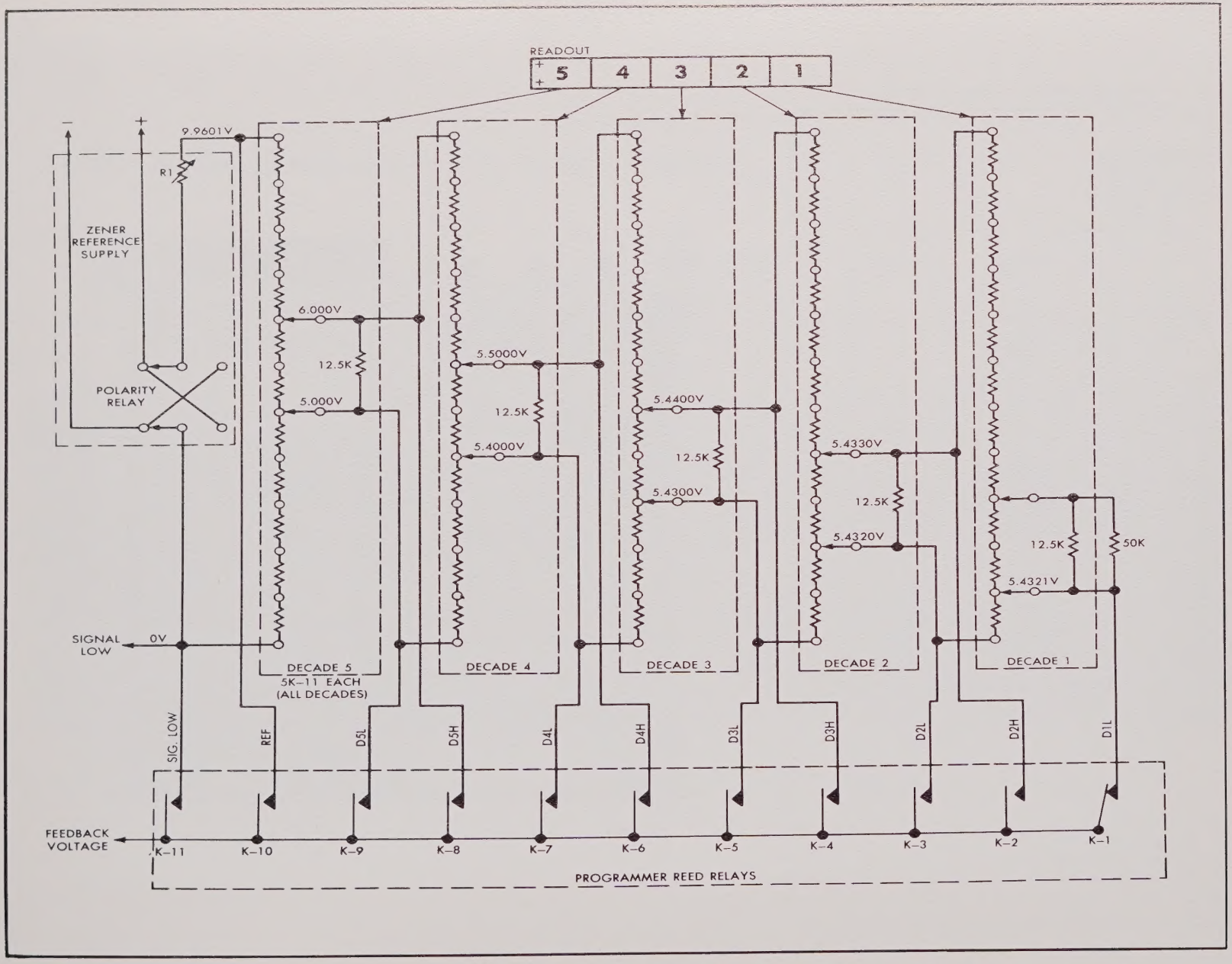
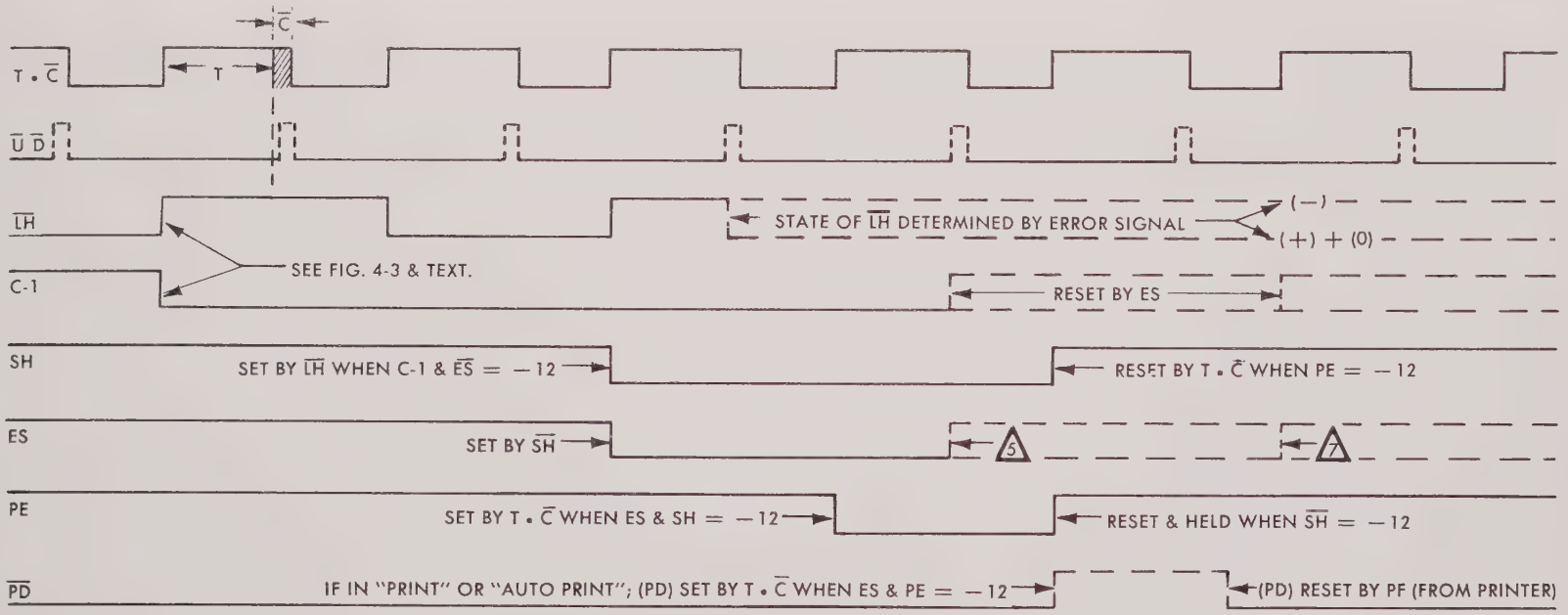



*Figure 9. Stepping Switch, Kelvin-Varley Divider, and Relay Portion of the Programmer.*

| COUNTER POSITION | FEEDBACK | LOW-HIGH FLIP-FLOP | ERROR | FORWARD FLIP-FLOP | BACKWARD FLIP-FLOP | READOUT ZEROS | SIGNALS NINES | OUTPUT | NOTES |
|---|---|---|---|---|---|---|---|---|---|
| 6 | Ref. Low | LH | (−) | — | — | — | — | △P | Upon receipt of △P, the polarity is reversed & (−) becomes (+) + (0). |
| *6 | Ref. Low | LH | (+) + (0) | F | $\overline{B}$ | $\overline{D_5 0}$ | — | Decade 5 | Inhibits the turn-around signal to the "F" Flip-Flop and steps Decade 5 to Zero. |
| 6 | Ref. High | $\overline{LH}$ | (+) + (0) | — | — | — | — | △Q | One △Q per bit is provided until (−) error is obtained. |
| *5 | Dec. 5 Low | LH | (+) + (0) | F | $\overline{B}$ | $\overline{D_4 0}$ | — | Decade 4 | Steps Decade 4 to Zero. |
| 5 | Dec. 5 Low | LH | (−) | — | B | $\overline{D_5 0}$ | — | Decade 5 | Steps Decade 5 until (+) + (0) error is obtained (to Zero). |
| 5 | Dec. 5 High | $\overline{LH}$ | (+) + (0) | — | B | — | $\overline{D_5 9}$ | Decade 5 | Steps Decade 5 until (−) error is obtained. |
| *4 | Dec. 4 Low | LH | (+) + (0) | F | $\overline{B}$ | $\overline{D_3 0}$ | — | Decade 3 | Steps Decade 3 to Zero. |
| 4 | Dec. 4 Low | LH | (−) | — | B | $\overline{D_4 0}$ | — | Decade 4 | Steps Decade 4 until (+) + (0) error is obtained (to Zero). |
| 4 | Dec. 4 High | $\overline{LH}$ | (+) + (0) | — | B | — | $\overline{D_4 9}$ | Decade 4 | Steps Decade 4 until (−) error is obtained. |
| 3 | Dec. 3 Low | LH | (−) | — | B | $\overline{D_3 0}$ | — | Decade 3 | Steps Decade 3 until (+) + (0) error is obtained (to Zero). |
| 3 | Dec. 3 High | LH | (+) + (0) | — | B | — | $\overline{D_3 9}$ | Decade 3 | Steps Decade 3 until (−) error is obtained. |
| 2 | Dec. 2 Low | LH | (−) | — | B | $\overline{D_2 0}$ | — | Decade 2 | Steps Decade 2 until (+) + (0) error is obtained (to Zero). |
| 2 | Dec. 2 High | $\overline{LH}$ | (+) + (0) | — | B | — | $\overline{D_2 9}$ | Decade 2 | Steps Decade 2 until (−) error is obtained. |
| 1 | Dec. 1 Low | LH | (−) | — | B | $\overline{D_1 0}$ | — | Decade 1 | Steps Decade 1 until (+) error is obtained (to Zero). |
| 1 | Dec. 1 Low | $\overline{LH}$ | (+) | — | B | — | $\overline{D_1 9}$ | Decade 1 | Steps Decade 1 until error is not (+). |

*Figure 10. Tabular Presentation of V35B Logic.*


$\overline{C}$
T • $\overline{C}$
T
$\overline{U}$ $\overline{D}$
$\overline{LH}$
STATE OF $\overline{LH}$ DETERMINED BY ERROR SIGNAL
(−)
(+) + (0)
SEE FIG. 4-3 & TEXT.
C-1
RESET BY ES
SH
SET BY $\overline{LH}$ WHEN C-1 & $\overline{ES}$ = −12
RESET BY T • $\overline{C}$ WHEN PE = −12
ES
SET BY $\overline{SH}$
5
7
PE
SET BY T • $\overline{C}$ WHEN ES & SH = −12
RESET & HELD WHEN $\overline{SH}$ = −12
$\overline{PD}$
IF IN "PRINT" OR "AUTO PRINT"; (PD) SET BY T • $\overline{C}$ WHEN ES & PE = −12
(PD) RESET BY PF (FROM PRINTER)

NOTES:

1. "SET" OR RESET OCCURS WHEN INDICATED TERM GOES FROM −12 TO 0 VOLTS, EXCEPT AS NOTED.
2. PD IS HELD IN THE RESET CONDITION WHEN NOT IN "PRINT" OR "AUTO PRINT".
3. ES IS HELD IN THE SET CONDITION WHEN PD = −12 (SET).
4. SOLID LINES INDICATE THAT EVENT ALWAYS OCCUR AT THE TIMES AND IN THE STATE SHOWN; — DASHED LINES INDICATE THAT TIMES AND/OR STATES ARE DEPENDENT ON SPECIFIED CONDITIONS.

5 IF IN "AUTO PRINT", ES WILL BE RESET BY $\overline{U}$ $\overline{D}$ WHEN PE = −12, (IF $\overline{U}$ $\overline{D}$ EXISTS).

6. IF ES RESET, PD CANNOT BE SET AND THE PRINT SIGNAL IS INHIBITED.

7 IF ES IS NOT RESET AT 5 IT WILL REMAIN SET UNTIL MS (TRIGGER CONTROL FF) IS SET (−12) AND THE FIRST T • $\overline{C}$ (SEE NOTE 1) RESETS ES. THE MS FF IS NOT SHOWN ON THIS CHART SINCE THERE IS NO SPECIFIC TIMING RELATIONSHIP.

*Figure 11. Chart: End of Scan, Print Timing, and Logic.*

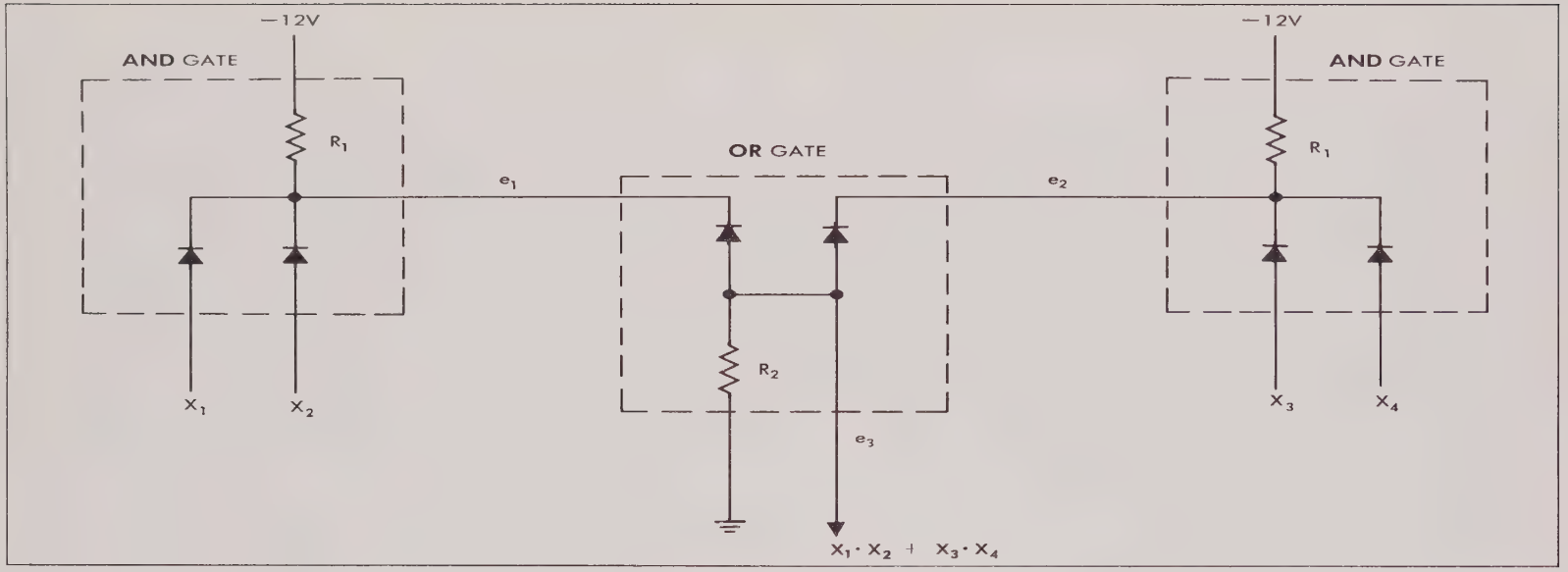



*Figure 12. AND-OR Gates.*

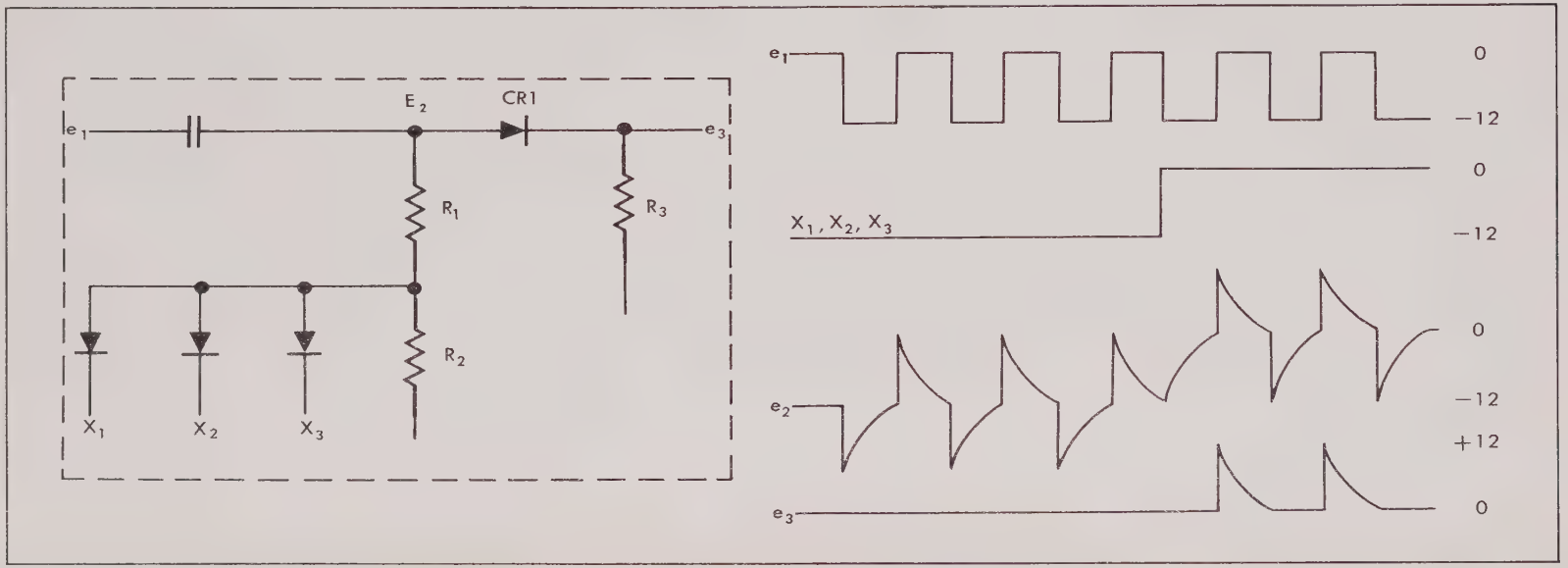



*Figure 13. AC Coupled AND Gate.*

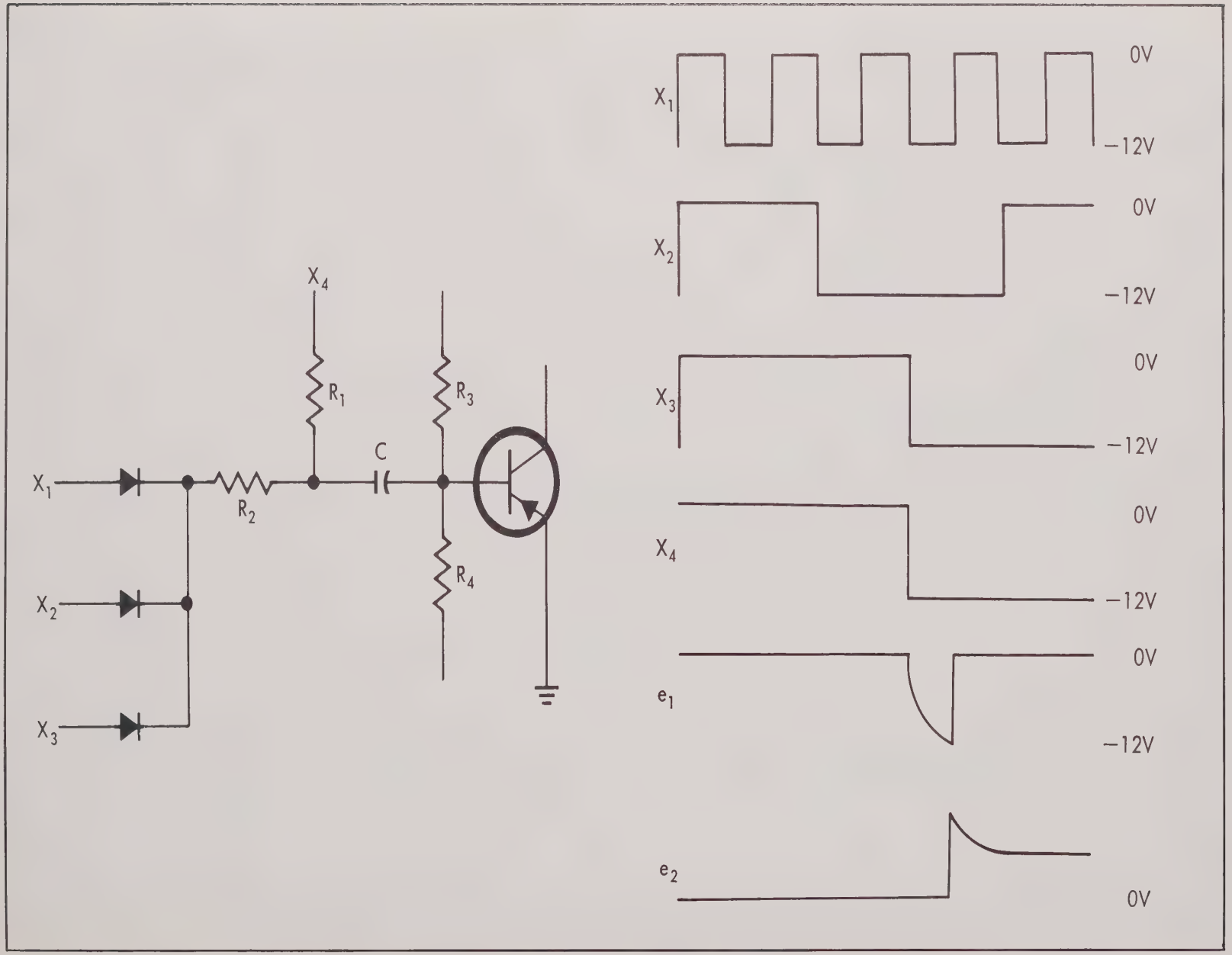



*Figure 14. Flip-flop Trigger Circuits.*

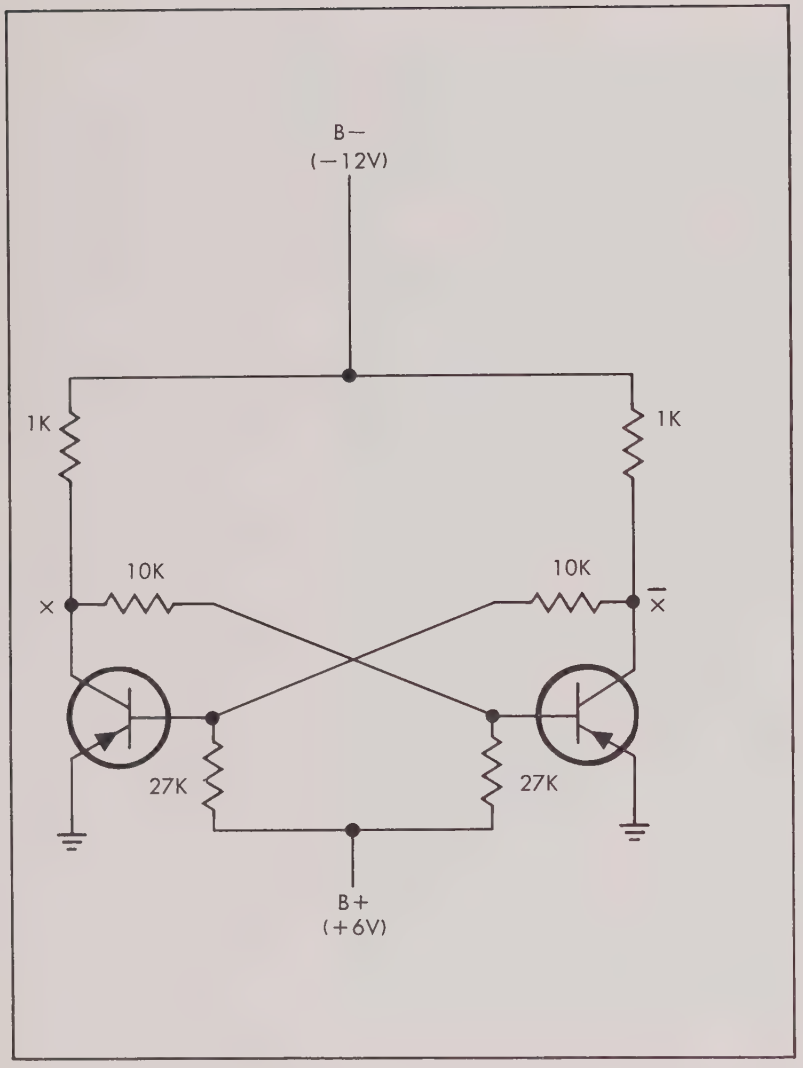



*Figure 15. Flip-flop Only.*

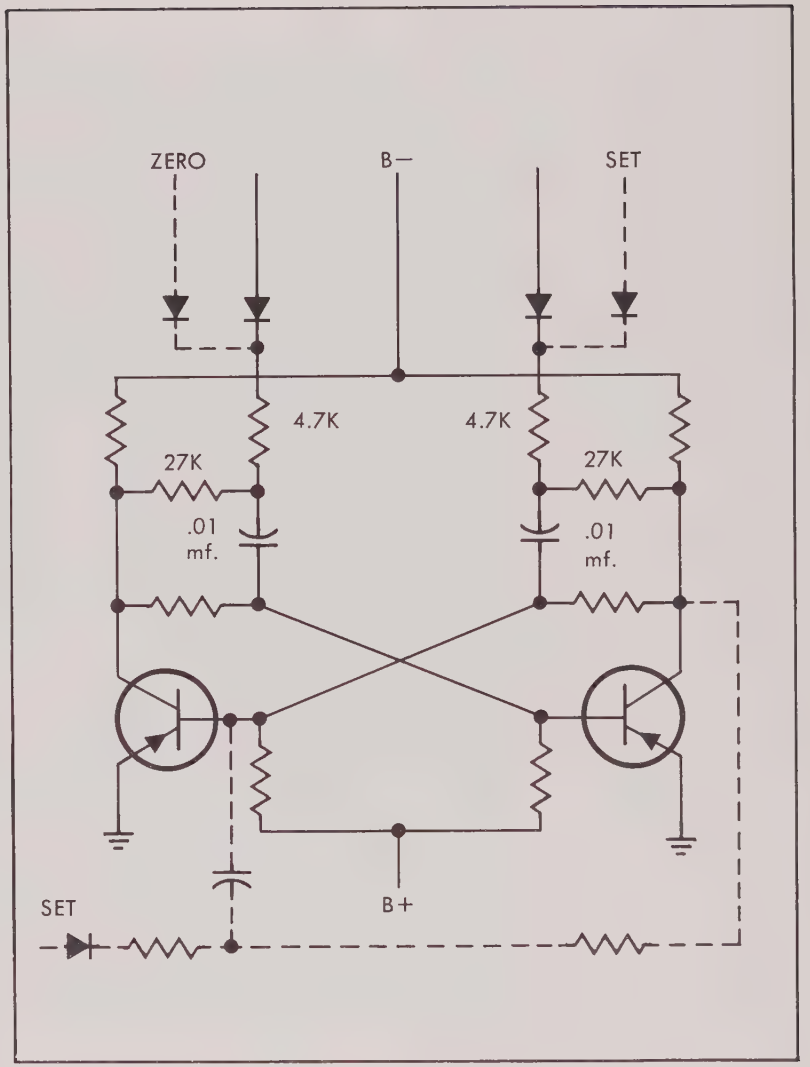



*Figure 16. Flip-flop with Trigger.*

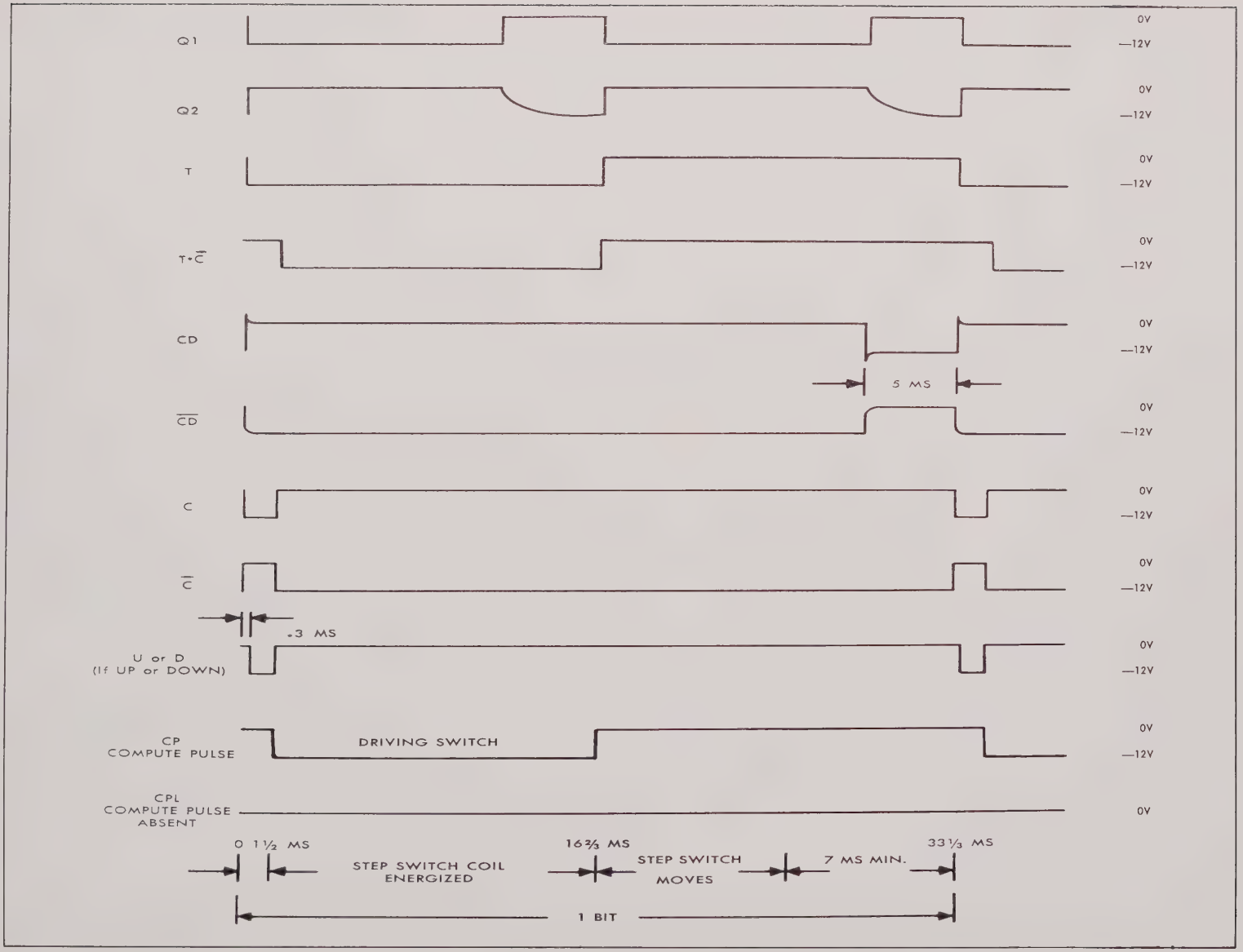



*Figure 17. Chart: Timing.*

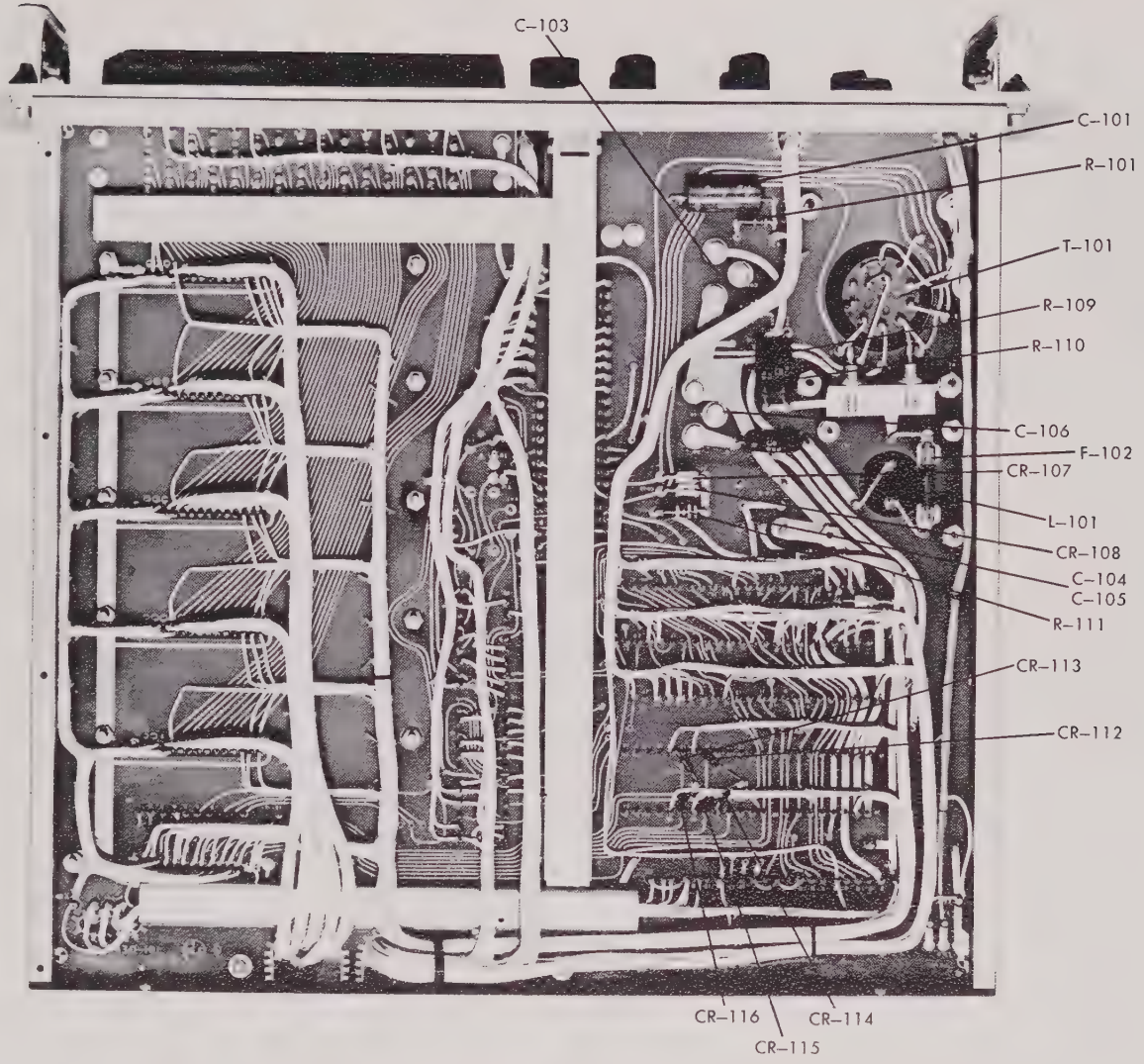



*Figure 18. Digital Voltmeter, Bottom View.*

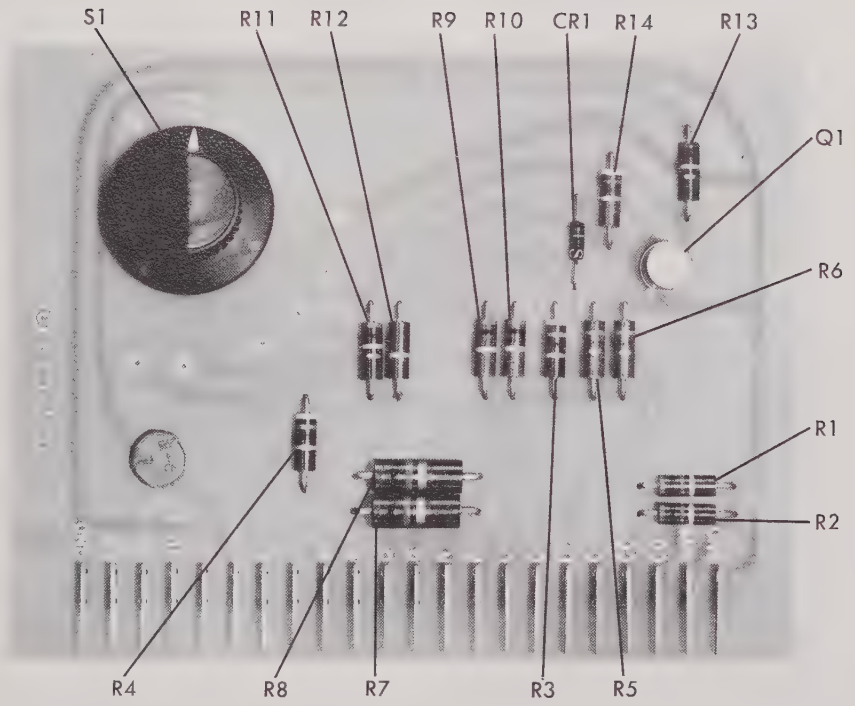



*Figure 19. Dummy Amplifier Used to Simulate Error Amplifier.*

| Test No. | SWITCH POSITIONS | | | Special Instructions | Dummy Amplifier | FORWARD SCAN | | | Reverse Scan Completed (C–1) | NOTES: |
|---|---|---|---|---|---|---|---|---|---|---|
| | Range | Power | Mode | | | Start (C–1) | Intermediate | Finish (C–6) | | |
| 1 | AUTO | ON | SS | GROUND $\overline{P}$ | U | ? | ? | +xxxx.x | | 1. Set Function Switch to "DC", all tests. |
| 2 | AUTO | ON | — | GROUND $\overline{P}$ | D | | | | +0000.0 | |
| 3 | AUTO | ON | SS | GROUND $\overline{P}$ | D | +0000.0 | NO CHANGE | +0.0000 | | |
| 4 | AUTO | ON | — | GROUND $\overline{P}$ | $\overline{U}$ $\overline{D}$ | | NO CHANGE | | +9.9990 | |
| 5 | AUTO | ON | SS | GROUND $\overline{P}$ | D | + 9.9990 | NO CHANGE | + 9.9990 | | |
| 6 | AUTO | ON | — | GROUND $\overline{P}$ | ③ U | | NO CHANGE | | +9.9999 | |
| 7 | AUTO | ON | SS | GROUND $\overline{P}$ | U | +9.9999 | NO CHANGE | +9999.9 | | |
| 8 | AUTO | ON | — | GROUND $\overline{P}$ | D | | NO CHANGE | | +0000.0 | |
| 9 | AUTO | ON | SS | CLEAR $\overline{P}$, GROUND P | U | −0000.0 | NO CHANGE | −0.0000 | | |
| 10 | AUTO | ON | — | CLEAR $\overline{P}$, GROUND P | $\overline{U}$ $\overline{D}$ | | NO CHANGE | | −9.9990 | |
| 11 | AUTO | ON | SS | CLEAR $\overline{P}$, GROUND P | U | −9.9990 | NO CHANGE | −9.9990 | | |
| 12 | AUTO | ON | — | CLEAR $\overline{P}$, GROUND P | ③ D | | NO CHANGE | | −9.9999 | |
| 13 | AUTO | ON | SS | CLEAR $\overline{P}$, GROUND P | D | −9.9999 | NO CHANGE | −9999.9 | | |
| 14 | AUTO | ON | — | CLEAR $\overline{P}$, GROUND P | ③ U | | | | −0000.0 | |
| 15 | AUTO | ON | SS | CLEAR P | D | −0000.0 | −0.0000 | −0000.0 | | |
| 16 | AUTO | ON | — | | U | | | | −0000.0 | |
| 17 | AUTO | ON | SS | | $\overline{U}$ $\overline{D}$ | −0000.0 | - 0.0000 | - 0000.0 | | |
| 18 | AUTO | ON | — | | U | | | | −0000.0 | |
| 19 | AUTO | ON | SS | | U | −0000.0 | −0.0000 | +0000.0 | | |
| 20 | AUTO | ON | — | | D | | | | +0000.0 | |
| 21 | AUTO | ON | SS | | $\overline{U}$ $\overline{D}$ | +0000.0 | +0.0000 | +0000.0 | | |
| 22 | AUTO | ON | — | | D | | | | +0000.0 | |
| 23 | 1000 | ON | SS | | U | +0000.0 | NO CHANGE | +000.00 | | |
| 24 | | ON | — | | D | | NO CHANGE | | +000.00 | |
| 25 | 100 | ON | SS | | U | +000.00 | NO CHANGE | +00.000 | | |
| 26 | | ON | — | | D | | NO CHANGE | | +00.000 | |
| 27 | 10 | ON | SS | | U | +00.000 | NO CHANGE | +0.0000 | | |
| 28 | 10 | ON | — | | D | | NO CHANGE | | +0.0000 | |
| 29 | 10 | PRINT | SS | | U | +0.0000 | NO CHANGE | +0.0000 | | |
| 30 | 10 | PRINT | — | | D | | NO CHANGE | | +0.0000 | Print command issued |
| 31 | 10 | PRINT | SS, AUTO, CONT. | Try All Mode Switch Positions | U | N O S C A N | | | | Instrument locked up at C-1 (end of scan) |
| 32 | 10 | ON,–THEN AUTO PRINT | SS | | U | +0.0000 | NO CHANGE | +0.0000 | | |
| 33 | 10 | ON,–THEN AUTO PRINT | — | | ⑤ D | | NO CHANGE | | +0.0000 | No print com. issued |
| 34 | 10 | ON,–THEN AUTO PRINT | — | | ⑤ D | +0.0000 | NO CHANGE | −0.0000 | | Counter will stay at C-6 until "U" is applied |
| 35 | 10 | ON,–THEN AUTO PRINT | — | | ⑤ U | | NO CHANGE | | - 0.0000 | No print com. issued |
| 36 | 10 | ON,–THEN AUTO PRINT | — | | ⑤ U | −0.0000 | NO CHANGE | +0.0000 | | Counter will stay at C-6 until "D" is applied |
| 37 | 10 | ON,–THEN AUTO PRINT | — | | ③ D THEN $\overline{U}$ $\overline{D}$ | | NO CHANGE | | +0.0000 | Print command issued |
| 38 | 10 | ON,–THEN AUTO PRINT | SS, AUTO, CONT. | Try All Mode Switch Positions | | N O S C A N | | | | Instrument locked up at C-1 (end of scan) |
| 39 | 10 | ON | St'dby, Then Note ④ | | NOTE ④ | ? | ? | ? | ? | |

2. SS= Single Scan; always complete ALL other indicated settings before operating SS.

③ Switch dummy rapidly from previous to indicated position.

④ With dummy amp. (DA) at U D, set mode switch (MS) to auto; no scan should occur. When DA is set to U or D, a scan to C-6 should result. Return MS to st'by and set DA to the opposite position (U or D as req'd); a reverse scan to C-1 should result. With DA at UD, set MS to Cont., a scan to C-6 should result.

⑤ These lines (2) show the complete cycle initiated by the indicated error pulse. This pulse starts the Rev. scan (from C-6 to C-1) and the presence of the error pulse at ES automatically recycles the Fw'd scan to C-6.

*Figure 17. Chart: Timing.*

| TEST NO. | | SYMPTOM | COUNTER CONDITIONS | PROBABLE AREA OF TROUBLE | LOCALIZING HINTS & INSTRUCTIONS |
|---|---|---|---|---|---|
| 1. | | Faulty Fwd. Scan | Not at C-1 and not at C-6 initially, or more than one output | 11430-731 | If more than one counter output is true (C-1 thru C-6) at a time, the fault lies in one of the FF's concerned, or in their drive matrix. With C-1 grounded, approx 6V should be measured across CR-3. |
| | | | Stops Before C-6 | | |
| | | | At C-6 initially | 11430-731 or 11430-300 | CR-28 or associated circuitry on 11430-731 or connections to 11430-300. ES not true; defective ES FF on 11430-300. |
| | | | Remains at C-1 | 11430-731, 11430-300, or 11430-860 | Circuits associated with the forward drive line (11430-731), connections to 11430-300; faulty ES, PD or F FF. Proceed to Test No. 39, check pin 10 of 11430-860 for trigger pulse called for by the mode switch position. |
| 2. | a | Faulty Rev. Scan | Remains at C-6 | 11430-731 | Circuits associated with the rev. drive line including gate components, Q-13, C-13, CR-23, CR-25, CR-26, C-12, etc. |
| | | | | 11430-300 | LH FF or its triggers, B FF, pin 10 (M-2) should be false, defective turn-around gate (CR's 29, 30, 31, 32, 33 & 36). |
| | | | | 11430-200 | (—) FF or CP invert-amp (Q-1 & Q-2). |
| | | | | 11420-500 (Two Boards) | Any fault in any of the 5 amplifiers that would cause the $D_1C$ thru $D_5C$ outputs to be at GND. |
| | b | Polarity Not + | Reverse to C-1 | 11420-400 | Defective P FF. |
| | | | | 11420-800 | K-4 defective. |
| | c | Decade Runs Continuously | Reverse Scan Will Stop at Faulty Decade | 11430-734 | "Zero" lamp diode, associated with the decade in question, or wiring is faulty. Example: CR-78 for Decade 5. |
| | d | One Decade Fails to Run | Reverse to C-1, Scans by Faulty | 11430-734 | Affected decade drive signal at ground. Example: $D_5S$ may be shorted to GND or open; check CR-80, R-6, R-30 and associated circuitry. |
| | | | Decade Without | 11420-500 | Faulty power amplifier or associated wiring. |
| | | | Stopping to Compute | 11420-700 | Faulty decade or main board connector or wiring. |
| | e | All Decades Fail to Run | Reverse to C-1 | 11430-734 | No B— to pulling resistors, R-1, R-3, R-5, R-8, R-9 etc.; or (—), LH, or B may be permanently shorted to GND. |
| | | | | 11(5)(4)30-100 | No —15V to D board or decades. |
| 3. | | Decimal Incorrect | Reverse to C-1 | 11430-734 | Q-3, Q-4 FF not set; check FF and trigger circuitry. Also check Q-1 & Q-2 inverters and associated circuitry. |
| 9 | | | | 11420-800 | K-1 and/or K-3, and associated circuitry. |
| | | | | 11420-400 | Defective Q and/or R FF, and associated circuitry. |
| 4. | a | Same as 2a | Same as 2a | Same as 2a | Same as test 2a. |
| | b | Same as 2 | Same as 2c | Same as 2c | Same as 2c except nine lamp diodes are involved. |

| TEST NO. | | SYMPTOM | COUNTER CONDITIONS | PROBABLE AREA OF TROUBLE | LOCALIZING HINTS & INSTRUCTIONS |
|---|---|---|---|---|---|
| **10** | c | Same as 2d | Same as 2d | Same as 2d | Same as 2d |
| | d | Same as 2e | Same as 2e | Same as 2e | Same as 2e |
| | e | 1st Decade Not Zero | Reverse to C-1 | 11430-734 | (+) + (0) diode (CR-48) or associated wiring. |
| 6. | a | 1st Decade Still Zero | Reverse to C-1 | 11430-734 | CR-42, CR-43, CR-44, CR-48 grounded or R-22 open (or assoc. circuitry). |
| **12** | b | 1st Decade Runs Continuously | Reverse to C-1 | 11430-734 | CR-42 or associated wiring open. |
| 7. | | Decimal Incorrect | C-6 | 11420-400 | Defective Q and/or R FF or associated circuitry. |
| **13** | | | | 11420-800 | K-1 and/or K-3 or associated circuitry. |
| | | | | 11430-734 | CR-87, C-2, CR-28, R-7 or associated circuitry. |
| 8. **14** | | Decimal Incorrect (Returned to Test No. 6 Indication) | Reverse to C-1 | 11430-734 | Collector of Q-4 should have gone to ground at C-6, test 6. If not, check C-1, Q-3, Q-4 & associated circuitry. Also check CR-83. |
| 23. | | Decimal Incorrect | | 11420-800 | K-1 and/or K-3 or associated circuitry. |
| | | | | 11420-400 | CR-6, CR-18 or associated circuitry. |
| 25. | | Same as 23 | | Same as 23 | Same as 23 except CR-5 & CR-14. |
| 27. | | Same as 23 | | Same as 23 | Same as 23 except CR-4. |
| 30. **37** | | No Print Command | | 11430-300 | SH not set, PE not set, PD not set, in that order at end of scan; see Fig. 11. Check circuitry associated with these FF's. |
| | | | | 11420-400 | PC mono stable not firing; check Q-1, Q-2, CR-1 & associated circuitry. |
| 31. **38** | | Instrument Scans | | 11430-300 | PD has been reset; check associated circuitry to determine what is reseting PD. CR-44 defective. |
| 33. **35** | | Print Command Issued | | 11430-300 | Same as 30; also check CR-43 & associated circuitry. Check for C pulse at pin 1; if absent, check wiring thru print-power switch, S-104. |
| | | | | 11(4)(5)30-100 | Check wiring thru print-power switch, S-104. |
| 39. | | No Scan in One or More Modes | | 11430-860 | Check Q-1 & Q-2 and associated circuitry. |
| | | | | 11(4)(5)30-100 | Check wiring thru mode switch, S-103. |

NOTES:
1. If there is a failure at any test no., check to see that the indicated dummy amplifier error produces the correct error signal at J-103, namely: for + Pol; U = (+) and (+) + (0), $\overline{U}\,\overline{D}$ = (+) + (0) and D = (−). For −Pol; U = (−), $\overline{U}\,\overline{D}$ = (+) + (0) and D = (+) and (+) + (0).
2. Instructions for any specific test no. assume that all previous tests were OK.
3. If Test No's. are omitted, the test has been performed previously, as: steps 15 thru 22 confirm the results of previous steps.
4. The term "Associated Circuitry" means components, etched circuits, connectors and chassis wiring; probability of trouble area is in the order listed.
5. Symptoms, probable area of trouble and instructions are the same for step no's. in **9** and step no's. in 3 on the same line.

*Figure 21. Troubleshooting with Dummy Amplifier.*

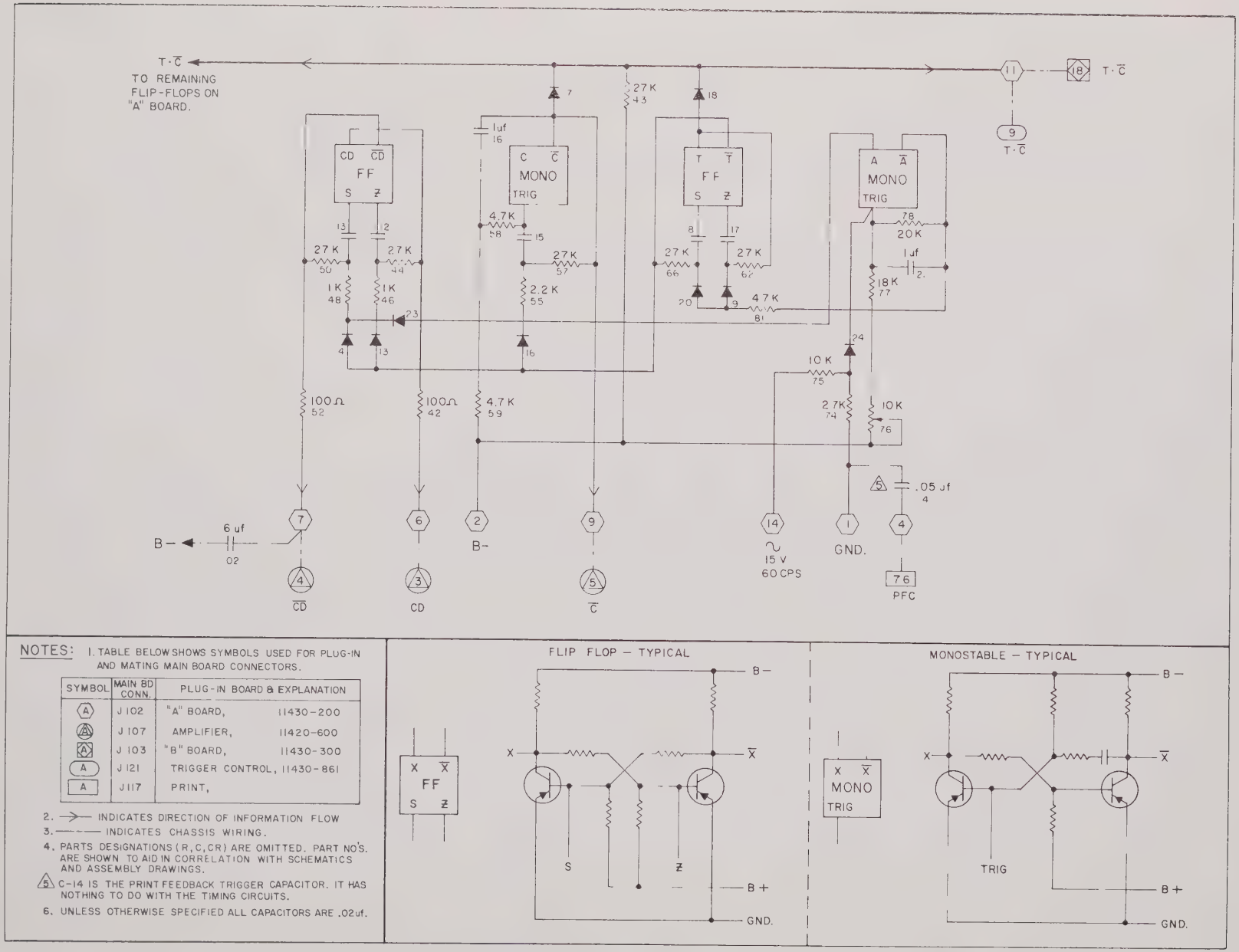



*Figure 22. Simplified Schematic & Logic Diagram: Timing Circuits.*

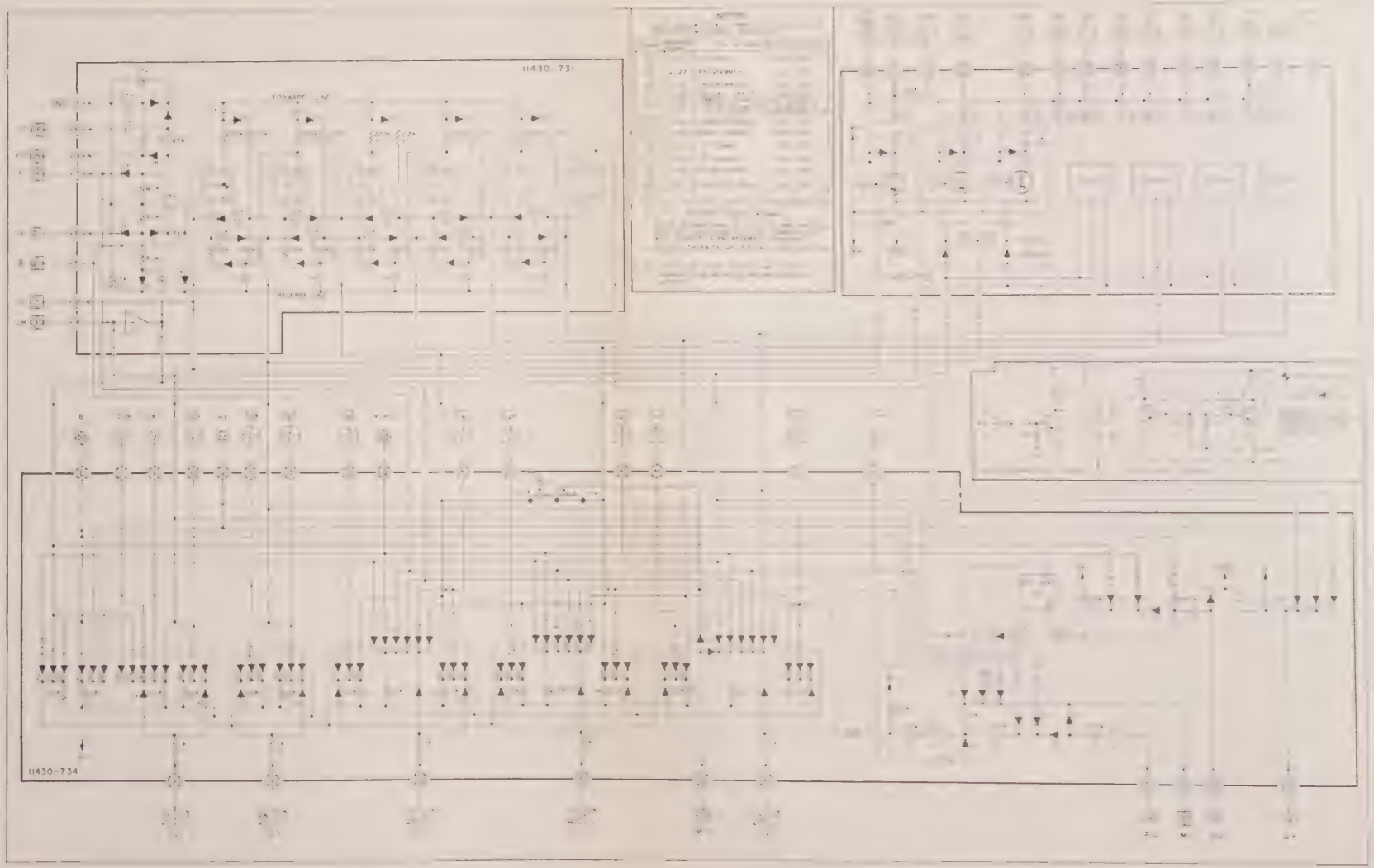



Figure 23. Simplified Schematic & Logic Diagram, Programmer

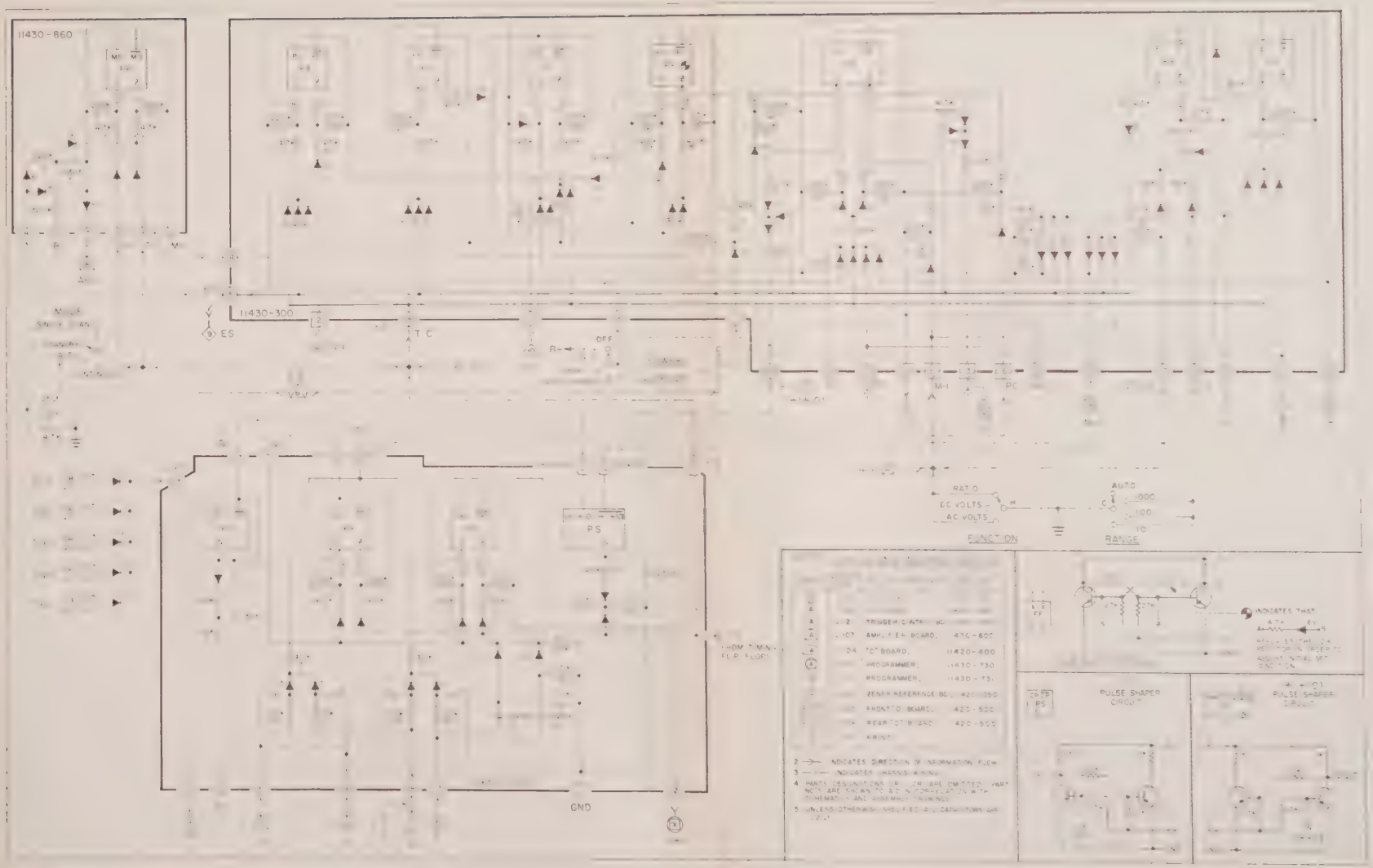



*Figure 24. Simplified Schematic & Logic Diagram: Programmer Commands.*

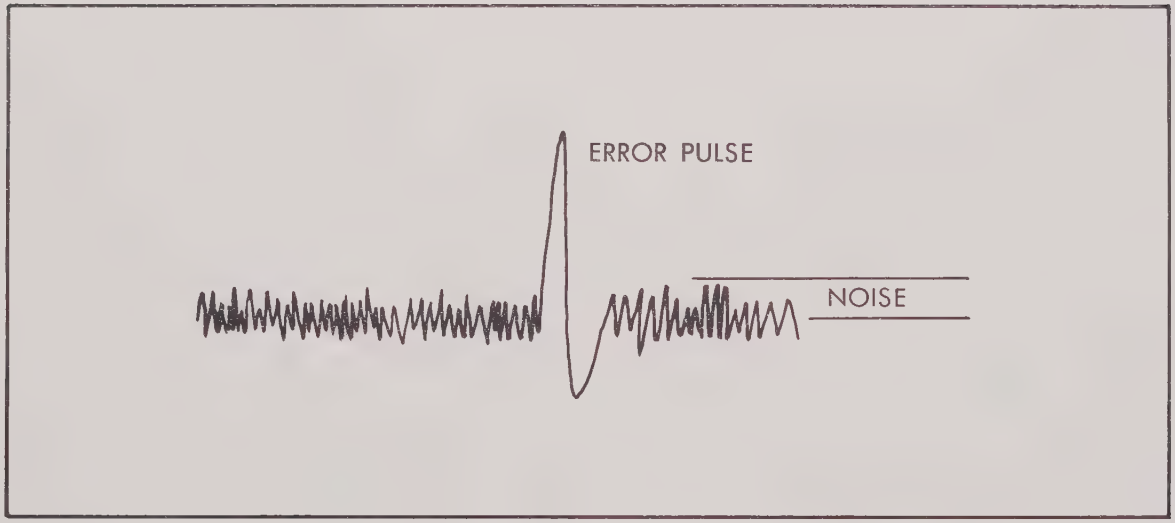



*Figure 25. Error Amplifier Output Wave Form.*

| VOLTS* | JUMPERS | VOLTS* | JUMPERS | VOLTS* | JUMPERS | VOLTS* | JUMPERS |
|---|---|---|---|---|---|---|---|
| 12.631–.619 | — | 12.312–.300 | 6–7 | 11.993–.981 | 7–8 | 11.675–.663 | 6–8 |
| .621–.609 | 1–2 | .302–.280 | 6–7, 1–2 | .983–.971 | 7–8, 1–2 | .665–.653 | 6–8, 1–2 |
| .611–.599 | 2–3 | .292–.280 | 6–7, 2–3 | .973–.961 | 7–8, 2–3 | .655–.643 | 6–8, 2–3 |
| .601–.589 | 1–3 | .282–.270 | 6–7, 1–3 | .963–.951 | 7–8, 1–3 | .645–.633 | 6–8, 1–3 |
| .591–.579 | 3–4 | .272–.260 | 6–7, 3–4 | .953–.941 | 7–8, 3–4 | .635–.623 | 6–8, 3–4 |
| .581–.569 | 3–4, 1–2 | .262–.250 | 6–7, 1–2, 3–4 | .943–.931 | 7–8, 3–4, 1–2 | .625–.613 | 6–8, 3–4, 1–2 |
| .571–.559 | 2–4 | .252–.240 | 6–7, 2–4 | .933–.921 | 7–8, 2–4 | .615–.603 | 6–8, 2–4 |
| .561–.549 | 1–4 | .242–.230 | 6–7, 1–4 | .923–.911 | 7–8, 1–4 | .605–.593 | 6–8, 1–4 |
| .552–.540 | 4–5 | .232–.220 | 6–7, 4–5 | .914–.902 | 7–8, 4–5 | .595–.583 | 6–8, 4–5 |
| .542–.530 | 4–5, 1–2 | .222–.210 | 6–7, 4–5, 1–2 | .904–.892 | 7–8, 4–5, 1–2 | .585–.573 | 6–8, 4–5, 1–2 |
| .532–.520 | 4–5, 2–3 | .213–.201 | 6–7, 4–5, 2–3 | .894–.882 | 7–8, 4–5, 2–3 | .575–.563 | 6–8, 4–5, 2–3 |
| .522–.510 | 4–5, 1–3 | .203–.191 | 6–7, 4–5, 1–3 | .884–.872 | 7–8, 4–5, 1–3 | .565–.553 | 6–8, 4–5, 1–3 |
| .512–.500 | 3–5 | .193–.181 | 6–7, 3–5 | .874–.862 | 7–8, 3–5 | .555–.543 | 6–8, 3–5 |
| .502–.490 | 3–5, 1–2 | .183–.171 | 6–7, 3–5, 1–2 | .864–.852 | 7–8, 3–5, 1–2 | .545–.533 | 6–8, 3–5, 1–2 |
| .492–.480 | 2–5 | .173–.161 | 6–7, 2–5 | .854–.842 | 7–8, 2–5 | .535–.523 | 6–8, 2–5 |
| .482–.470 | 1–5 | .163–.151 | 6–7, 1–5 | .844–.832 | 7–8, 1–5 | .525–.513 | 6–8, 1–5 |
| .472–.460 | 5–6 | .153–.141 | 5–7 | .834–.822 | 7–8, 5–6 | .516–.504 | 5–8 |
| .462–.450 | 5–6, 1–2 | .143–.131 | 5–7, 1–2 | .824–.812 | 7–8, 5–6, 1–2 | .506–.494 | 5–8, 1–2 |
| .452–.440 | 5–6, 2–3 | .133–.121 | 5–7, 2–3 | .814–.802 | 7–8, 5–6, 2–3 | .496–.484 | 5–8, 2–3 |
| .442–.430 | 5–6, 1–3 | .123–.111 | 5–7, 1–3 | .804–.792 | 7–8, 5–6, 1–3 | .486–.474 | 5–8, 1–3 |
| .432–.420 | 5–6, 3–4 | .113–.101 | 5–7, 3–4 | .794–.782 | 7–8, 5–6, 3–4 | .476–.464 | 5–8, 3–4 |
| .422–.410 | 5–6, 3–4, 1–2 | .103–.091 | 5–7, 3–4, 1–2 | .784–.772 | 7–8, 5–6, 3–4, 1–2 | .466–.454 | 5–8, 3–4, 1–2 |
| .412–.400 | 5–6, 2–4 | .093–.081 | 5–7, 2–4 | .774–.762 | 7–8, 5–6, 2–4 | .456–.444 | 5–8, 2–4 |
| .402–.390 | 5–6, 1–4 | .083–.071 | 5–7, 1–4 | .764–.752 | 7–8, 5–6, 1–4 | .446–.434 | 5–8, 1–4 |
| .392–.380 | 4–6 | .073–.061 | 4–7 | .754–.742 | 7–8, 4–6 | .436–.424 | 4–8 |
| .382–.370 | 4–6, 1–2 | .063–.051 | 4–7, 1–2 | .745–.733 | 7–8, 4–6, 1–2 | .426–.414 | 4–8, 1–2 |
| .372–.360 | 4–6, 2–3 | .053–.041 | 4–7, 2–3 | .735–.723 | 7–8, 4–6, 2–3 | .416–.404 | 4–8, 2–3 |
| .362–.350 | 4–6, 1–3 | .043–.031 | 4–7, 1–3 | .725–.713 | 7–8, 4–6, 1–3 | .406–.394 | 4–8, 1–3 |
| .352–.340 | 3–6 | .033–.021 | 3–7 | .715–.703 | 7–8, 3–6 | .396–.384 | 3–8 |
| .342–.330 | 3–6, 1–2 | .023–.011 | 3–7, 1–2 | .705–.693 | 7–8, 3–6, 1–2 | .386–.374 | 3–8, 1–2 |
| .332–.320 | 2–6 | .013–.001 | 2–7 | .695–.683 | 7–8, 2–6 | .376–.364 | 2–8 |
| .322–.310 | 1–6 | 12.003–11.991 | 1–7 | .685–.673 | 7–8, 1–6 | .366–.354 | 1–8 |

*MEASURED BETWEEN PINS 6 & 5 OF P–802 (ZENER REF. ASSY), WITH *NO* JUMPERS INSTALLED.

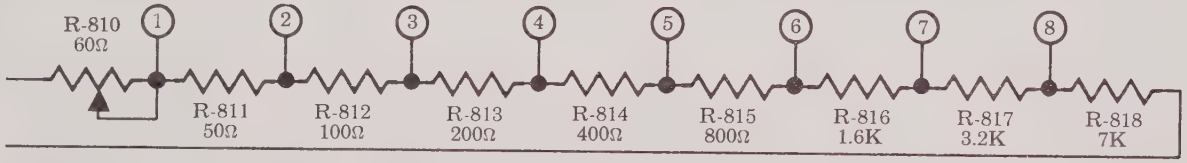



*Figure 26. Jumper Connections for 10-Volt Calibrate Resistors.*

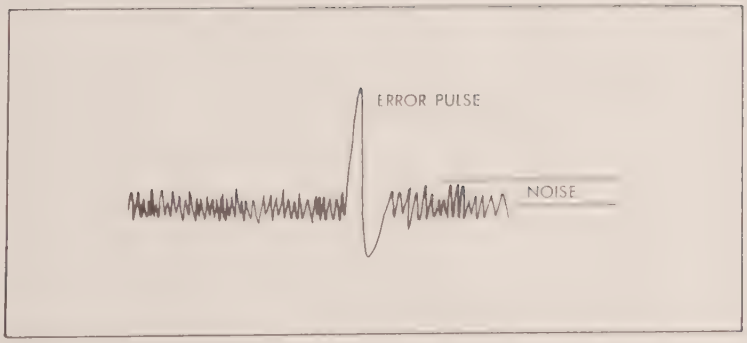



*Figure 25. Error Amplifier Output Wave Form*

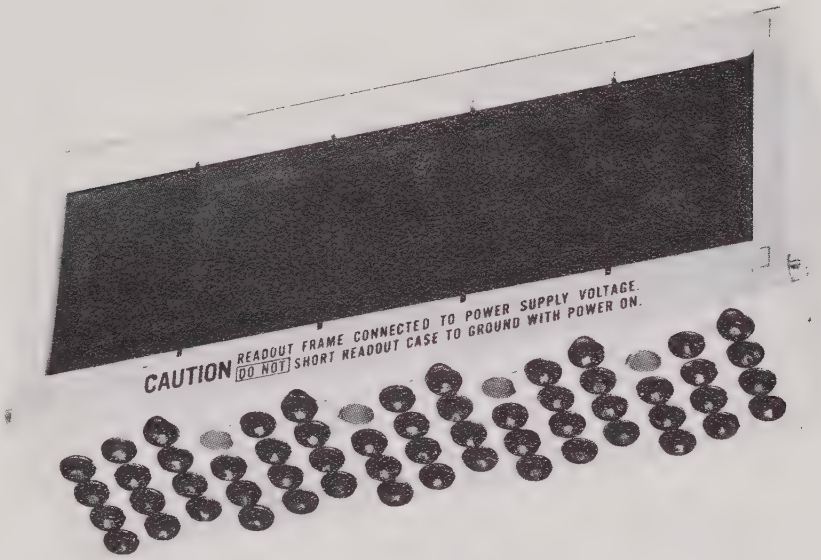



*Figure 28. Front View of Readout (without visor) Showing Lamps Correctly Installed.*

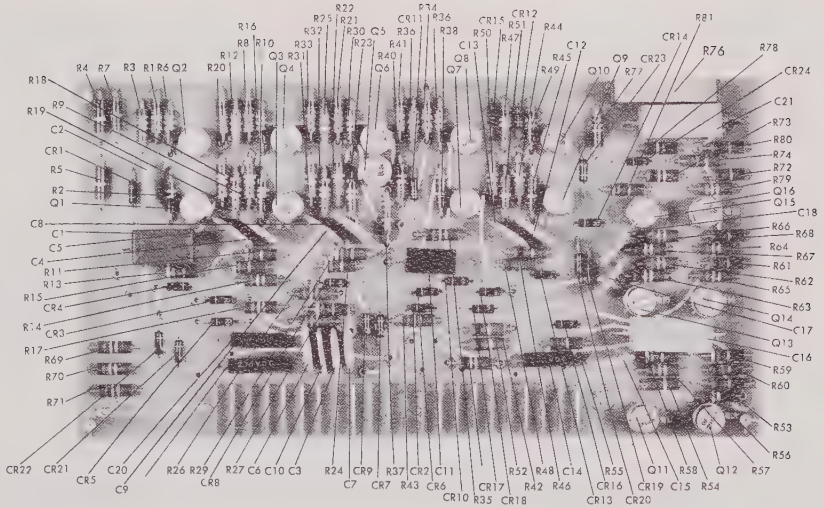



*Figure 29. A Board.*

| CIRCUIT REFERENCE | PART NUMBER | DESCRIPTION | QTY PER UNIT | MANUFACTURER |
|---|---|---|---|---|
| C2–C10, 12, 13, 15, 17, 18 | BT.02 | CAPACITOR, .02 Mfd., ±20% | 14 | RMC |
| C14, 19, 20 | ME2–473E | CAPACITOR, Metalized Paper, .047 Mfd., 200 VDC | 3 | Electron |
| C11 | ME1–254E | CAPACITOR, Metalized Paper, .25 Mfd., 100 VDC | 1 | Electron |
| C1 | ME1–504E | CAPACITOR, Metalized Paper, .5 Mfd., 100 VDC | 1 | Electron |
| C16, 21 | ME1–105 | CAPACITOR, Metalized Paper, 1 Mfd., 100 VDC | 2 | Electron |
| R76 | 275–1–103 | POTENTIOMETER, 10K | 1 | Bourns |
| R9, 18, 22, 31 | EB2241 | RESISTOR, 220K, ½W, 10% | 4 | Allen Bradley |
| R3, 6, 12, 14, 16, 17, 25, 26 R28, 30, 35, 36, 39, 43, 44, 50 R57, 62, 64, 65, 66, 69, 70, 71, 79 | EB2731 | RESISTOR, 27K, ½W, 10% | 25 | Allen Bradley |
| R77 | EB1831 | RESISTOR, 18K, ½W, 10% | 1 | Allen Bradley |
| R78 | EB1331 | RESISTOR, 20K, ½W, 10% | 1 | Allen Bradley |
| R2, 10, 19, 23, 32, 40, 47, 49, 56, 63, 67, 73, 75 | EB1031 | RESISTOR, 10K, ½W, 10% | 13 | Allen Bradley |
| R11, 13, 15, 24, 27, 29, 37, 38, 58, 59, 81 | EB4721 | RESISTOR, 4.7K, ½W, 10% | 11 | Allen Bradley |
| R74 | EB2721 | RESISTOR, 2.7K, ½W, 10% | 1 | Allen Bradley |
| R4, 5, 45, 51, 54, 55 | EB2221 | RESISTOR, 2.2K, ½W, 10% | 6 | Allen Bradley |
| R1, 7, 8, 20, 21, 33, 34 R41, 46, 48, 53, 61, 68, 72, 80 | EB1021 | RESISTOR, 1K, ½W, 10% | 15 | Allen Bradley |
| R60 | EB2015 | RESISTOR, 200 Ohm, ½W, 10% | 1 | Allen Bradley |
| R42, 52 | EB1011 | RESISTOR, 100 Ohm, ½W, 10% | 2 | Allen Bradley |
| CR1–CR24 | 5003–002 | DIODE | 24 | NLS |
| Q1–Q16 | 2N1374 | TRANSISTOR | 16 | T.I. |

| VOLTS* | JUMPERS | VOLTS* | JUMPERS | VOLTS* | JUMPERS | VOLTS* | JUMPERS |
|---|---|---|---|---|---|---|---|
| 12.631–.619 | — | 12.312–.300 | 6-7 | 11.993–.981 | 7–8 | 11.675–.663 | 6–8 |
| .621–.609 | 1-2 | .302–.280 | 6-7, 1-2 | .983–.971 | 7–8, 1-2 | .665–.653 | 6–8, 1–2 |
| .611–.599 | 2-3 | .292–.280 | 6-7, 2-3 | .973–.961 | 7–8, 2-3 | .655–.643 | 6–8, 2–3 |
| .601–.589 | 1-3 | .282–.270 | 6-7, 1-3 | .963–.951 | 7–8, 1–3 | .645–.633 | 6–8, 1–3 |
| .591–.579 | 3-4 | .272–.260 | 6-7, 3-4 | .953–.941 | 7–8, 3–4 | .635–.623 | 6–8, 3–4 |
| .581–.569 | 3-4, 1-2 | .262–.250 | 6-7, 1-2, 3-4 | .943–.931 | 7–8, 3–4, 1–2 | .625–.613 | 6–8, 3–4, 1–2 |
| .571–.559 | 2-4 | .252–.240 | 6-7, 2-4 | .933–.921 | 7–8, 2–4 | .615–.603 | 6–8, 2–4 |
| .561–.549 | 1-4 | .242–.230 | 6-7, 1-4 | .923–.911 | 7–8, 1–4 | .605–.593 | 6–8, 1–4 |
| .552–.540 | 4-5 | .232–.220 | 6-7, 4-5 | .914–.902 | 7–8, 4–5 | .595–.583 | 6–8, 4–5 |
| .542–.530 | 4–5, 1-2 | .222–.210 | 6-7, 4-5, 1-2 | .904–.892 | 7–8, 4–5, 1–2 | .585–.573 | 6–8, 4–5, 1–2 |
| .532–.520 | 4–5, 2-3 | .213–.201 | 6-7, 4-5, 2-3 | .894–.882 | 7–8, 4–5, 2–3 | .575–.563 | 6–8, 4–5, 2–3 |
| .522–.510 | 4–5, 1-3 | .203–.191 | 6-7, 4-5, 1-3 | .884–.872 | 7–8, 4–5, 1–3 | .565–.553 | 6–8, 4–5, 1–3 |
| .512–.500 | 3-5 | .193–.181 | 6-7, 3-5 | .874–.862 | 7–8, 3–5 | .555–.543 | 6–8, 3–5 |
| .502–.490 | 3–5, 1-2 | .183–.171 | 6-7, 3-5, 1-2 | .864–.852 | 7–8, 3–5, 1–2 | .545–.533 | 6–8, 3–5, 1–2 |
| .492–.480 | 2-5 | .173–.161 | 6-7, 2-5 | .854–.842 | 7–8, 2–5 | .535–.523 | 6–8, 2–5 |
| .482–.470 | 1-5 | .163–.151 | 6-7, 1-5 | .844–.832 | 7–8, 1–5 | .525–.513 | 6–8, 1–5 |
| .472–.460 | 5-6 | .153–.141 | 6-7 | .834–.822 | 7–8, 5–6 | .516–.504 | 5–8 |
| .462–.450 | 5-6, 1-2 | .143–.131 | 6-7, 1-2 | .824–.812 | 7–8, 5–6, 1–2 | .506–.494 | 5–8, 1–2 |
| .452–.440 | 5-6, 2-3 | .133–.121 | 6-7, 2-3 | .814–.802 | 7–8, 5–6, 2–3 | .496–.484 | 5–8, 2–3 |
| .442–.430 | 5-6, 1-3 | .123–.111 | 6-7, 1-3 | .804–.792 | 7–8, 5–6, 1–3 | .486–.474 | 5–8, 1–3 |
| .432–.420 | 5-6, 3-4 | .113–.101 | 6-7, 3-4 | .794–.782 | 7–8, 5–6, 3–4 | .476–.464 | 5–8, 3–4 |
| .422–.410 | 5-6, 3-4, 1-2 | .103–.091 | 6-7, 3-4, 1-2 | .784–.772 | 7–8, 5–6, 3–4, 1–2 | .466–.454 | 5–8, 3–4, 1–2 |
| .412–.400 | 5-6, 2-4 | .093–.081 | 6-7, 2-4 | .774–.762 | 7–8, 5–6, 2–4 | .456–.444 | 5–8, 2–4 |
| .402–.390 | 5-6, 1-4 | .083–.071 | 6-7, 1-4 | .764–.752 | 7–8, 5–6, 1–4 | .446–.434 | 5–8, 1–4 |
| .392–.380 | 4-6 | .073–.061 | 4-7 | .754–.742 | 7–8, 4–6 | .436–.424 | 4–8 |
| .382–.370 | 4-6, 1-2 | .063–.051 | 4-7, 1-2 | .744–.733 | 7–8, 4–6, 1–2 | .426–.414 | 4–8, 1–2 |
| .372–.360 | 4-6, 2-3 | .053–.041 | 4-7, 2-3 | .734–.724 | 7–8, 4–6, 2–3 | .416–.404 | 4–8, 2–3 |
| .362–.350 | 4-6, 1-3 | .043–.031 | 4-7, 1-3 | .725–.713 | 7–8, 4–6, 1–3 | .406–.394 | 4–8, 1–3 |
| .352–.340 | 3-6 | .033–.021 | 3-7 | .715–.703 | 7–8, 3–6 | .396–.384 | 3–8 |
| .342–.330 | 3-6, 1-2 | .023–.011 | 3-7, 1-2 | .705–.693 | 7–8, 3–6, 1–2 | .386–.374 | 3–8, 1–2 |
| .332–.320 | 2-6 | .013–.001 | 2-7 | .695–.683 | 7–8, 2–6 | .376–.364 | 2–8 |
| .322–.310 | 1-6 | 12.003–11.991 | 1-7 | .685–.673 | 7–8, 1–6 | .366–.354 | 1–8 |

*MEASURED BETWEEN PINS 6 & 5 OF P-802 (ZENER REF. ASSY), WITH NO JUMPERS INSTALLED

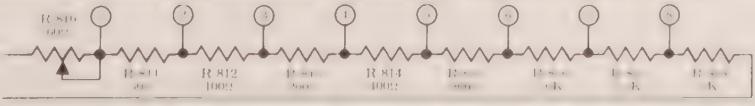



*Figure 26 Jumper Connections for 10 Volt Calibrate Resistors*

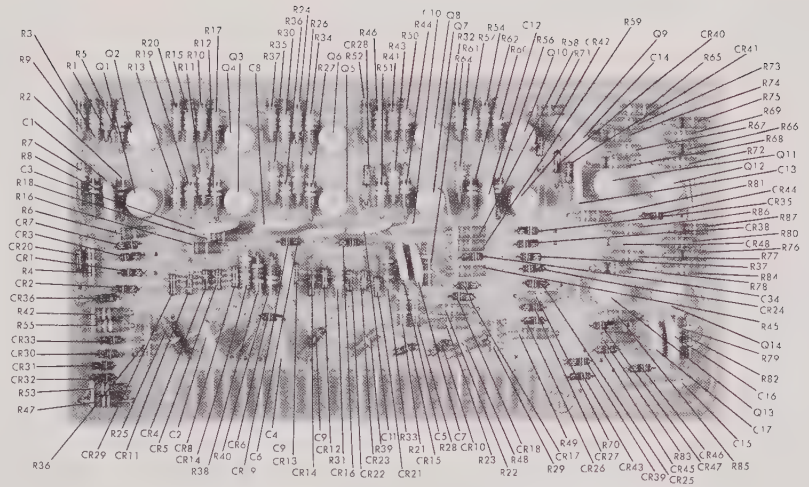


*Figure 30. B Board.*

| CIRCUIT REFERENCE | PART NUMBER | DESCRIPTION | QTY PER UNIT | MANUFACTURER |
|---|---|---|---|---|
| C1-C17 | BT.02 | CAPACITOR, .02 Mfd., ±20% | 17 | Radio Mat'ls. Co. |
| R7, 23, 26, 35, 40, 43, 48, 61, 67, 70, 73, 86 | EB2241 | RESISTOR, 220K, ½W, 10% | 12 | Allen Bradley |
| R42, 47, 53, 55 | EB4731 | RESISTOR, 47K, ½W, 10% | 4 | Allen Bradley |
| R3, 5, 11, 15, 17, 22, 29, 30, 34, 46, 50, 57, 60, 63, 69, 72, 80, 84, 77 | EB2731 | RESISTOR, 27K, ½W, 10% | 19 | Allen Bradley |
| R2, 8, 12, 19, 27, 36, 44, 51, 56, 62, 68, 74, 78 | EB1031 | RESISTOR, 10K, ½W, 10% | 13 | Allen Bradley |
| R4, 6, 13, 16, 18, 21, 32, 38, 45, 49, 58, 59, 65, 71, 79, 81, 82, 83, 85, 31, 33 | EB4721 | RESISTOR, 4.7K, ½W, 10% | 21 | Allen Bradley |
| R25, 39 | EB2221 | RESISTOR, 2.2K, ½W, 10% | 2 | Allen Bradley |
| R1, 9, 10, 20, 24, 37, 41, 52, 54, 64, 66, 75, 76, 87, 14, 28 | EB1021 | RESISTOR, 1K, ½W, 10% | 16 | Allen Bradley |
| CR48 | ¼M6.8Z | DIODE, Zener | 1 | Motorola |
| CR1–CR47 | 5003–002 | DIODE | 47 | NLS |
| Q1–Q14 | 2N1374 | TRANSISTOR | 14 | T.I. |

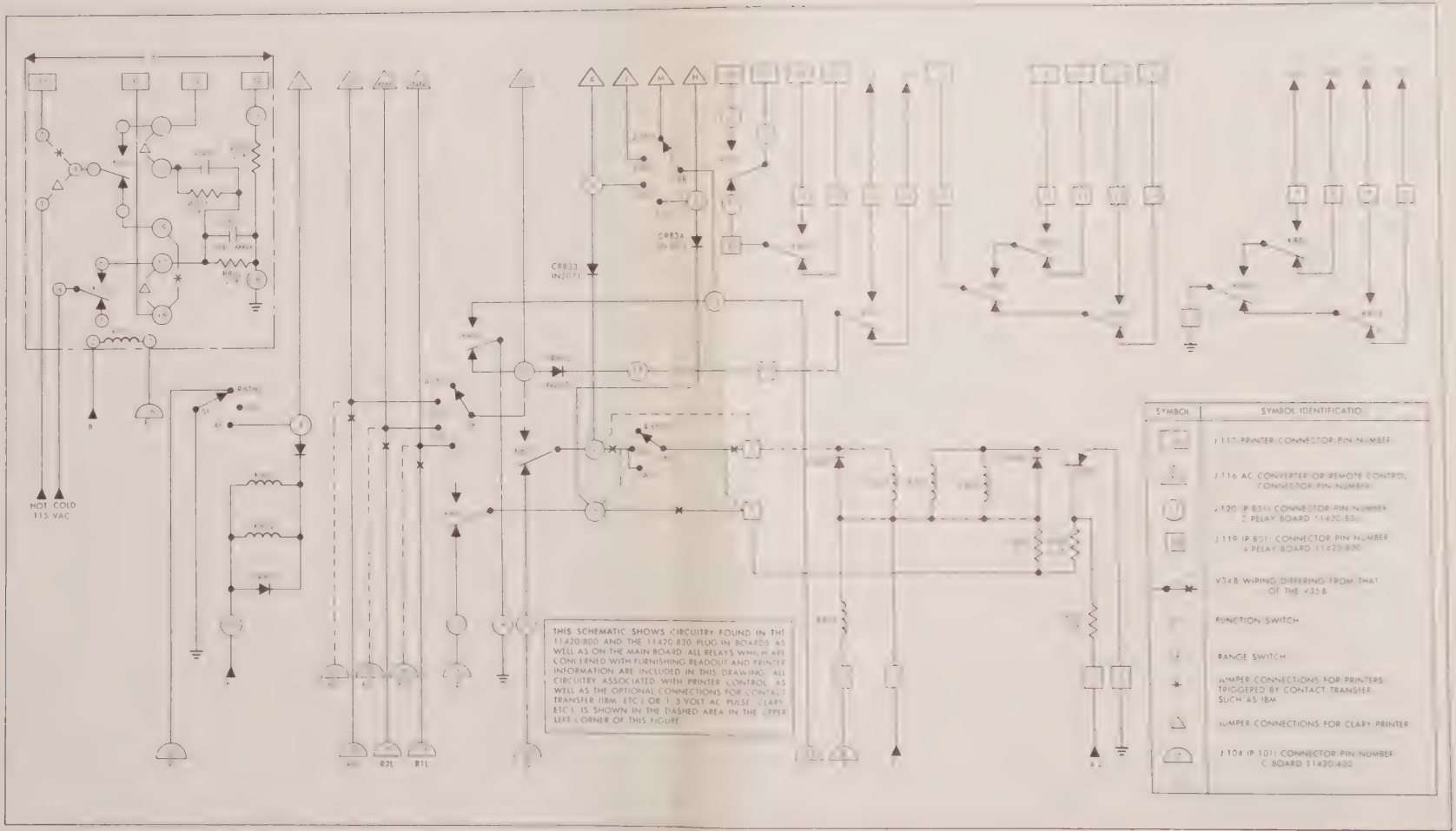

HOT COLD
115 VAC
PATH
CR833
IN2071
CR834
R2L
R1L
THIS SCHEMATIC SHOWS CIRCUITRY FOUND IN THE 11420-800 AND THE 11420-830 PLUG-IN BOARDS AS WELL AS ON THE MAIN BOARD. ALL RELAYS WHICH ARE CONCERNED WITH FURNISHING READOUT AND PRINTER INFORMATION ARE INCLUDED IN THIS DRAWING. ALL CIRCUITRY ASSOCIATED WITH PRINTER CONTROL AS WELL AS THE OPTIONAL CONNECTIONS FOR CONTACT TRANSFER (IBM, ETC.) OR 1.5 VOLT AC PULSE (CLARY ETC.) IS SHOWN IN THE DASHED AREA IN THE UPPER LEFT CORNER OF THIS FIGURE.
SYMBOL
SYMBOL IDENTIFICATIO
J 117 PRINTER CONNECTOR PIN NUMBER
J 116 AC CONVERTER OR REMOTE CONTROL CONNECTOR PIN NUMBER
J 120 (P 831) CONNECTOR PIN NUMBER 2 RELAY BOARD 11420-830
J 119 (P 801) CONNECTOR PIN NUMBER 4 RELAY BOARD 11420-800
V34 B WIRING DIFFERING FROM THAT OF THE V35 B
FUNCTION SWITCH
RANGE SWITCH
JUMPER CONNECTIONS FOR PRINTERS TRIGGERED BY CONTACT TRANSFER SUCH AS IBM
JUMPER CONNECTIONS FOR CLARY PRINTER
J 104 (P 101) CONNECTOR PIN NUMBER C BOARD 11420-800

Figure 37. Simplified Schematic, Range & Function Control.

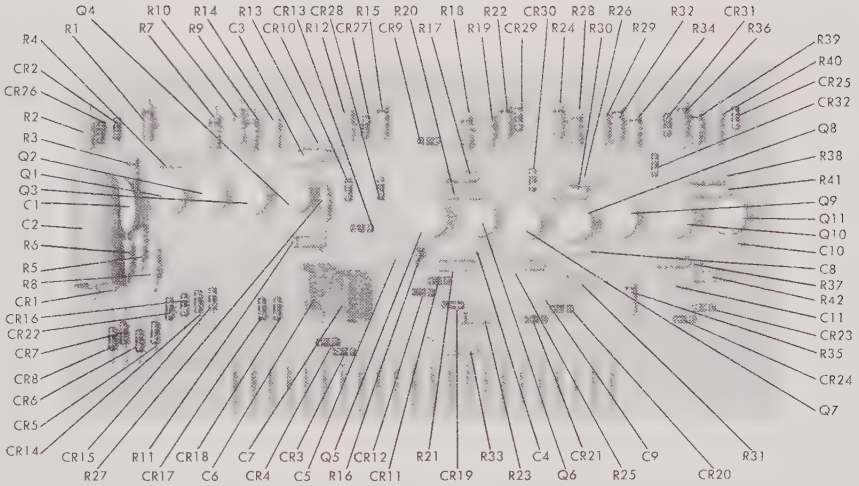
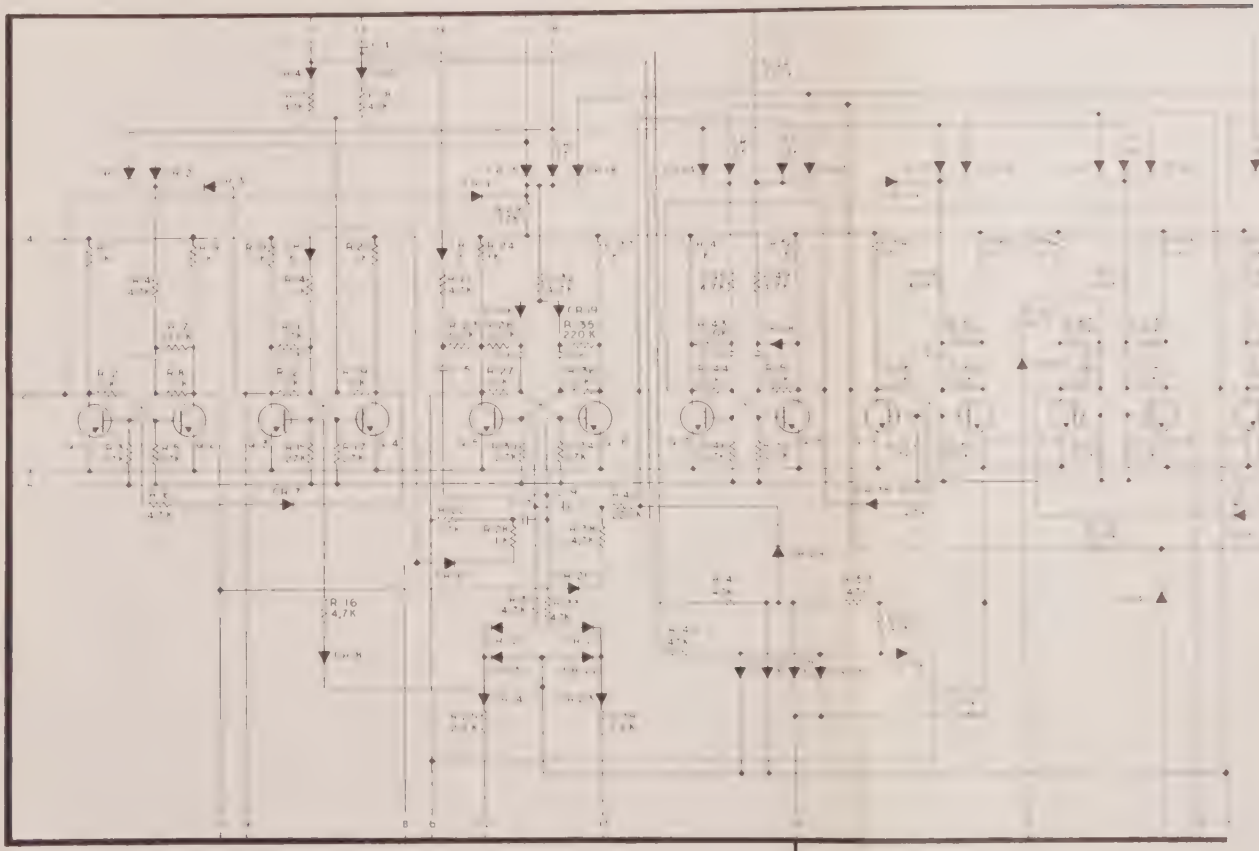



*Figure 31. C Board.*

| CIRCUIT REFERENCE | PART NUMBER | DESCRIPTION | QTY PER UNIT | MANUFACTURER |
|---|---|---|---|---|
| R16, R21 | EB2241 | RESISTOR, 220K, ½W, 10% | 2 | Allen Bradley |
| R5, R25, R27, R31, R37, R42 | EB2731 | RESISTOR, 27K, ½W, 10% | 6 | Allen Bradley |
| R3, R7, R9, R18, R28, R34, R39 | EB1031 | RESISTOR, 10K, ½W, 10% | 7 | Allen Bradley |
| R2, R6, R8, R14, R19, R29, R33, R40 | EB4721 | RESISTOR, 4.7K, ½W, 10% | 8 | Allen Bradley |
| R4, R10, R12, R13, R20, R30, R41 | EB2221 | RESISTOR, 2.2K, ½W, 10% | 7 | Allen Bradley |
| R17, R26, R38 | EB1521 | RESISTOR, 1.5K, ½W, 10% | 3 | Allen Bradley |
| R1, R11, R15, R22, R23, R24, R32, R35, R36 | EB1021 | RESISTOR, 1K, ½W, 10% | 9 | Allen Bradley |
| C2 | 52RM25 | CAPACITOR, Electrolytic, 25 Mfd. 25 VDC | 1 | Ind. Cond. |
| C1, C3, C4, C5, C8, C9, C10, C11 | BT.02 | CAPACITOR, .02 Mfd., ± 20%, 100 VDC | 8 | RMC |
| C6, C7 | DEZ 473E | CAPACITOR, Metalized Mylar, .047 Mfd., 200 VDC | 2 | Electron |
| CR1 thru CR32 | 5003–002 | DIODE | 32 | NLS |
| Q1 thru Q11 | 2N1374 | TRANSISTOR | 11 | T.I. |

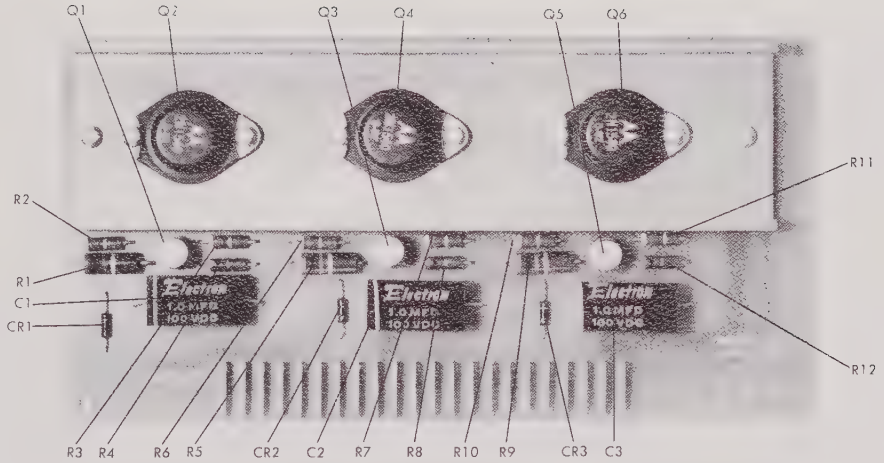



NOTES: UNLESS OTHERWISE SPECIFIED

1. TRANSISTORS ARE TYPE 2N1374.
2. CAPACITORS ARE .02uf.
3. DIODES ARE N.L.S. TYPE 5003-002.

SCHEMATIC
B BOARD ASS'Y.

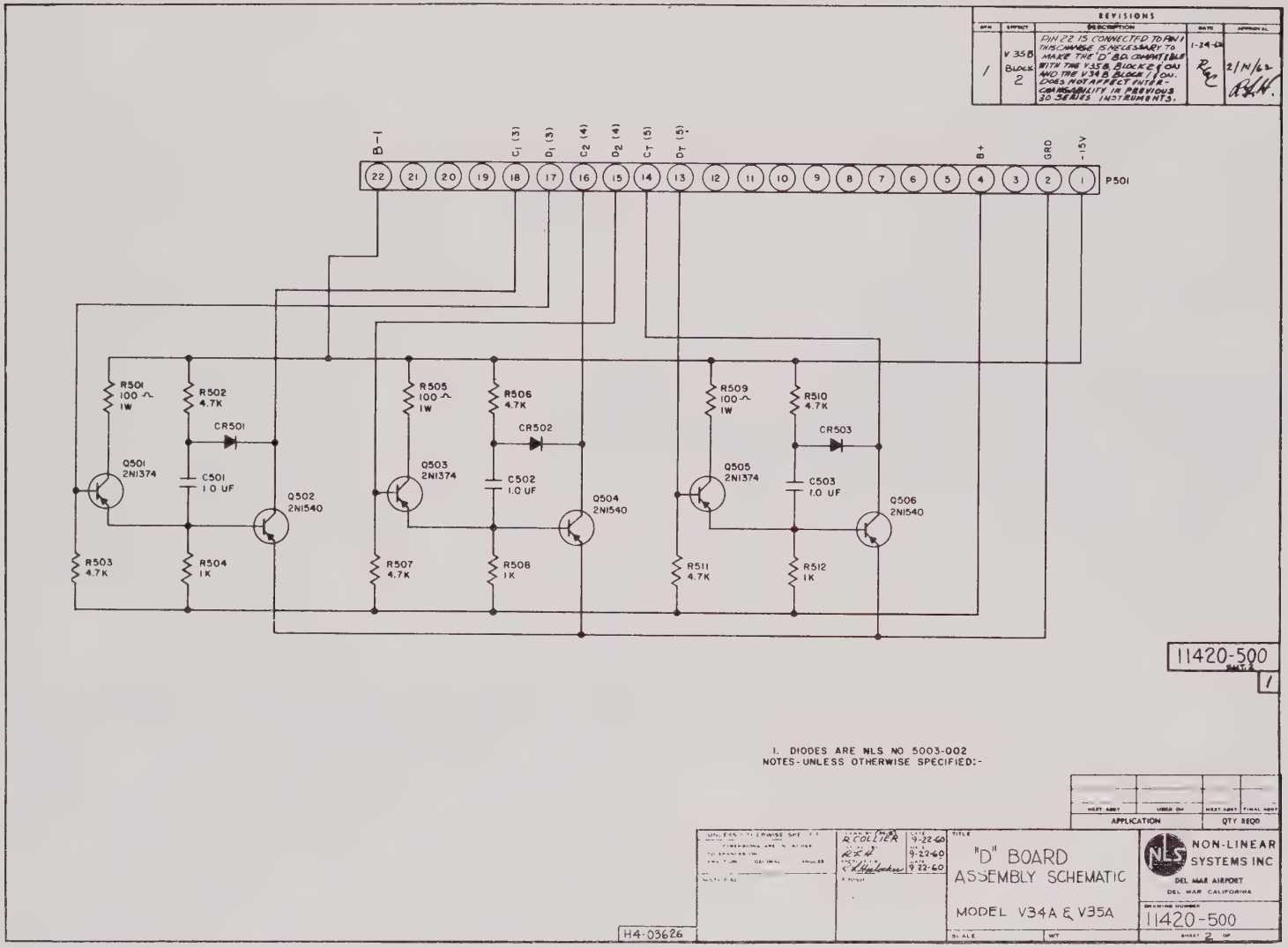
NON-LINEAR SYSTEMS INC
DEL MAR, CALIFORNIA




11420–500 D BOARD

*Figure 33. D Board (Instrument uses Two D Boards).*

| CIRCUIT REFERENCE | PART NUMBER | DESCRIPTION | QTY PER UNIT | MANUFACTURER |
|---|---|---|---|---|
| C1, C2, C3 | ME1–105 | CAPACITOR, Met. Paper, 1 Mfd., 100 VDC | 3 | Electron |
| R2, R3, R6, R7, R10, R11 | EB4721 | RESISTOR, 4.7K Ohm, ½ W, 10 % | 6 | Allen Bradley |
| R4, R8, R12 | EB1021 | RESISTOR, 1K Ohm, ½ W, 10 % | 3 | Allen Bradley |
| R1, R5, R9 | GB1011 | RESISTOR, 100 Ohm, 1W, 10 % | 3 | Allen Bradley |
| CR1, CR2, CR3 | 5003–002 | DIODE | 3 | NLS |
| Q2, Q4, Q6 | 2N1540 | TRANSISTOR | 3 | Motorola |
| Q1, Q3, Q5 | 2N1374 | TRANSISTOR | 3 | T.I. |


REVISIONS
DESCRIPTION
PIN 22 IS CONNECTED TO PIN 1 THIS CHANGE IS NECESSARY TO MAKE THE "D" BD. COMPATIBLE WITH THE V35B, BLOCK 2 CKT. BD. AND THE V34B, BLOCK 1 CKT. BD. DOES NOT AFFECT INTER-CHANGABILITY IN PREVIOUS 30 SERIES INSTRUMENTS.
1-24-62
2/N/62
B-1
C1 (3)
D1 (3)
C2 (4)
D2 (4)
CT (5)
DT (5)
B+
GRD
-15V
P501
R501 100 Ω 1W
R502 4.7K
CR501
Q501 2N1374
C501 1.0 UF
Q502 2N1540
R503 4.7K
R504 1K
R505 100 Ω 1W
R506 4.7K
CR502
Q503 2N1374
C502 1.0 UF
Q504 2N1540
R507 4.7K
R508 1K
R509 100 Ω 1W
R510 4.7K
CR503
Q505 2N1374
C503 1.0 UF
Q506 2N1540
R511 4.7K
R512 1K
11420-500
1
1. DIODES ARE NLS NO 5003-002
NOTES-UNLESS OTHERWISE SPECIFIED:-
NEXT ASSY
USED ON
NEXT ASSY
FINAL ASSY
APPLICATION
QTY REQD
R. COLLIER
9-22-60
9-22-60
9-22-60
TITLE
"D" BOARD ASSEMBLY SCHEMATIC
MODEL V34A & V35A
NON-LINEAR SYSTEMS INC
DEL MAR AIRPORT
DEL MAR CALIFORNIA
DRAWING NUMBER
11420-500
SCALE
WT
SHEET 2 OF
H4-03626

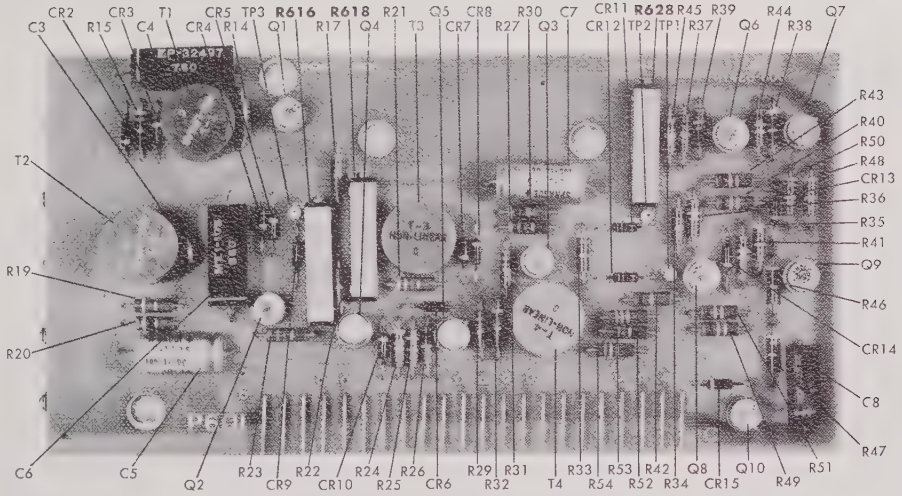



*Figure 34. Amplifier, Front View.*

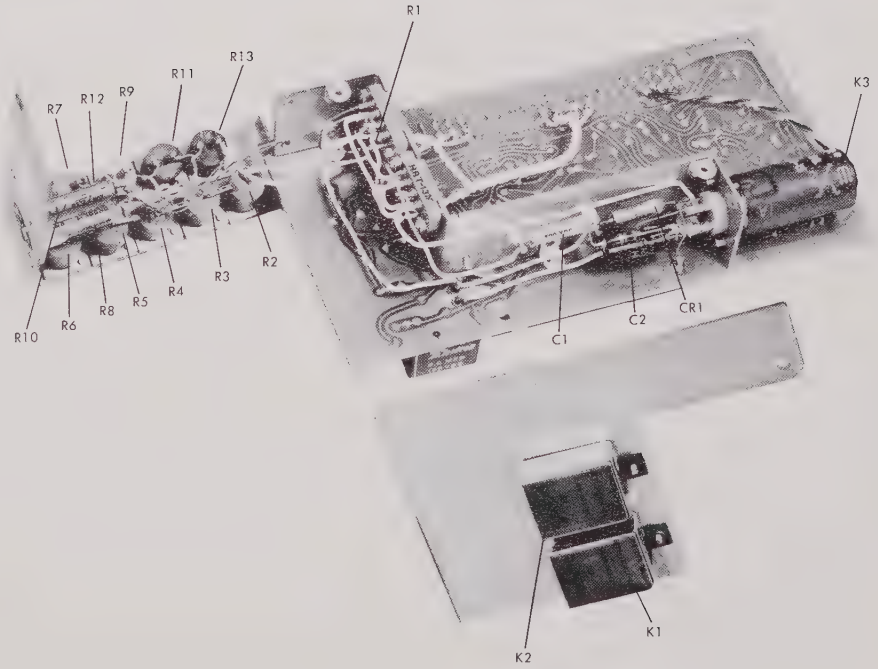



*Figure 35. Amplifier, Rear View (partially disassembled).*

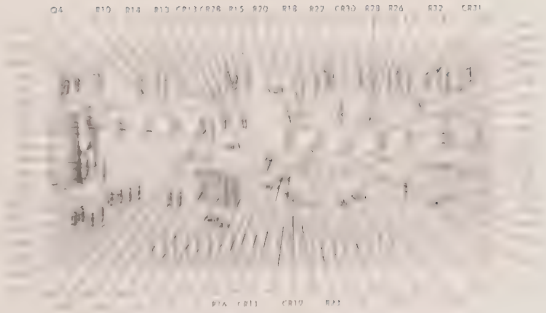


*Figure 31. C Board.*

| CIRCUIT REFERENCE | PART NUMBER | DESCRIPTION | QTY PER UNIT | MANUFACTURER |
|---|---|---|---|---|
| R16, R21 | EB2241 | RESISTOR, 220K, ½ W, 10% | 2 | Allen Bradley |
| R5, R25, R27, R31, R37, R42 | EB2731 | RESISTOR, 27K, ½ W, 10% | 6 | Allen Bradley |
| R3, R7, R9, R18, R28, R34, R39 | EB1031 | RESISTOR, 10K, ½ W, 10% | 7 | Allen Bradley |
| R2, R6, R8, R14, R19, R29, R33, R40 | EB4721 | RESISTOR, 4.7K, ½ W, 10% | 8 | Allen Bradley |
| R4, R10, R12, R13, R20, R30, R41 | EB2221 | RESISTOR, 2.2K, ½ W, 10% | 7 | Allen Bradley |
| R17, R26, R38 | EB1521 | RESISTOR, 1.5K, ½ W, 10% | 3 | Allen Bradley |
| R1, R11, R15, R22, R23, R24, R32, R35, R36 | EB1021 | RESISTOR, 1K, ½ W, 10% | 9 | Allen Bradley |
| C2 | 52RM25 | CAPACITOR, Electrolytic, 25 Mfd. 25 VDC | 1 | Ind. Cond. |
| C1, C3, C4, C5, C8, C9, C10, C11 | BT.02 | CAPACITOR, .02 Mfd., + 20%, 100 VDC | 8 | RMC |
| C6, C7 | DEZ 473E | CAPACITOR, Metalized Mylar, .047 Mfd., 200 VDC | 2 | Electron |
| CR1 thru CR32 | 5003–002 | DIODE | 32 | NLS |
| Q1 thru Q11 | 2N1374 | TRANSISTOR | 11 | T.I |

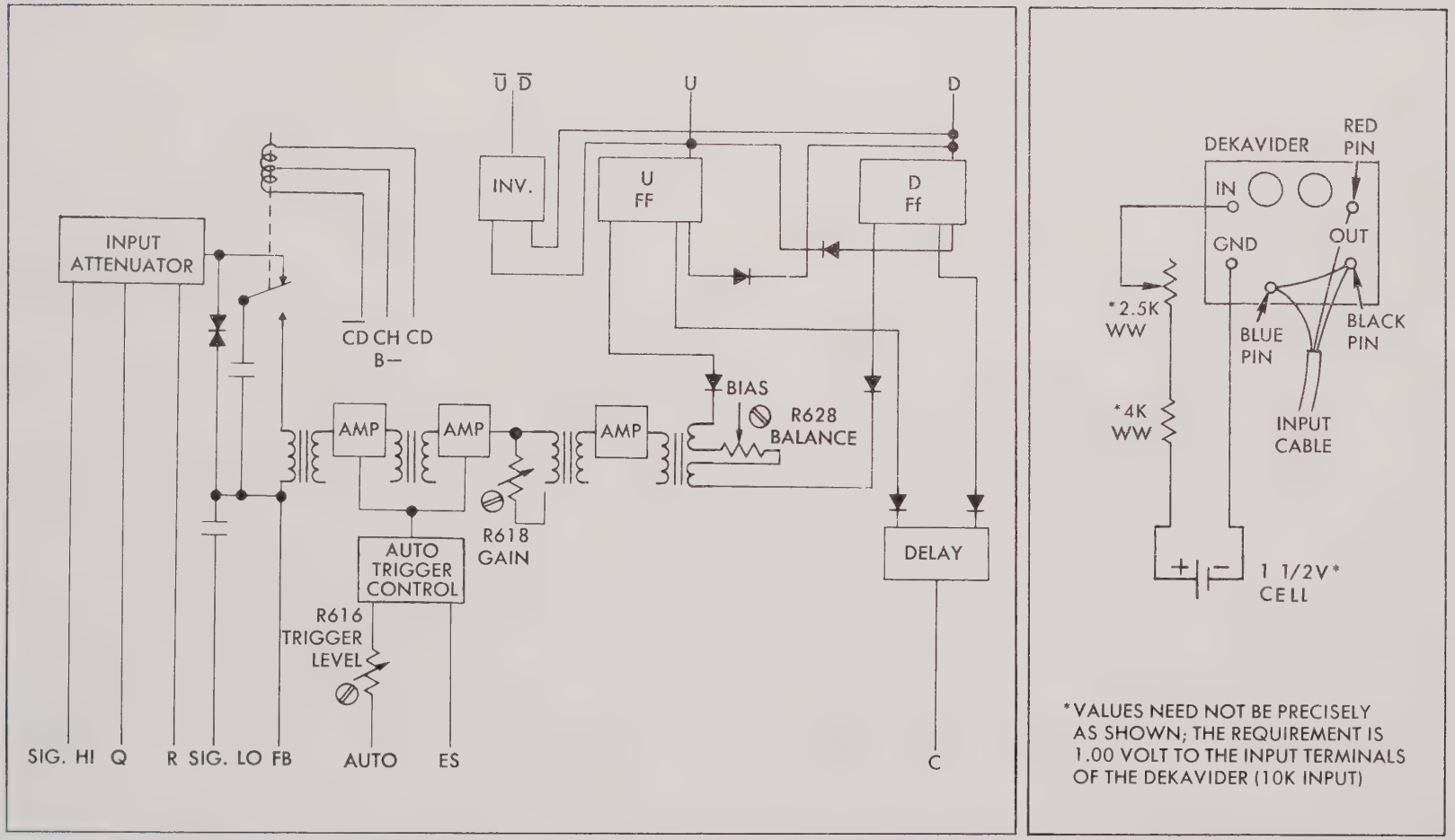



*Figure 36. Amplifier Block Diagram and Voltage Source for Test.*

| CIRCUIT REFERENCE | PART NUMBER | DESCRIPTION | QTY PER UNIT | MANUFACTURER |
|---|---|---|---|---|
| T1 | 11420–607 | TRANSFORMER, Isolation | 1 | NLS |
| T2 | 11420–608 | TRANSFORMER, Input | 1 | NLS |
| T3 | 11420–609 | TRANSFORMER, Interstage | 1 | NLS |
| T4 | 11420–610 | TRANSFORMER, Output | 1 | NLS |
| Q1, 2, 3 | 2N1301 | TRANSISTOR | 3 | RCA |
| Q6, 7, 8, 9 | 2N582 | TRANSISTOR | 4 | RCA |
| Q10 | 2N1374 | TRANSISTOR | 1 | TI |
| Q4, 5 | 2N444A | TRANSISTOR | 2 | GT |
| CR11, 12 | 1N662 | DIODE | 2 | Transitron |
| CR2–5, 7, 8, 10, 13, 14, 15 | 5003–002 | DIODE | 10 | NLS |
| CR6 | 1N749A | DIODE | 1 | TI |
| CR9 | ¼M6.8Z10 | DIODE | 1 | Motorola |
| C5, 7 | TE 1135 | CAPACITOR, Electrolytic, 100 Mfd, 12 VDCW | 2 | Sprague |
| C4 | 5002–001 | CAPACITOR | 1 | NLS |
| C6 | ME1–105 | CAPACITOR, Metalized Paper, 1 Mfd, 100 VDCW | 1 | Electron |
| C8 | ME1–254E | CAPACITOR, Metalized Paper, .25 Mfd, 10%, 100 VDCW | 1 | Electron |
| C3 | DD391 | CAPACITOR, Ceramic, 390 Mfd, 10%, 1000 VDCW | 1 | Centralab |
| R16 | 275–1–501 | POTENTIOMETER, 500 Ohm | 1 | Bourns |
| R28 | 275–1–102 | POTENTIOMETER, 1 K Ohm | 1 | Bourns |
| R18 | 275–1–202 | POTENTIOMETER, 2 K Ohm | 1 | Bourns |
| R31 | EB 1615 | RESISTOR, 160 Ohm, ½W, 5% | 1 | Allen Bradley |
| R24, 32 | EB 3015 | RESISTOR, 300 Ohm, ½W, 5% | 2 | Allen Bradley |
| R21 | EB 5615 | RESISTOR, 360 Ohm, ½W, 5% | 1 | Allen Bradley |
| R29 | EB 3615 | RESISTOR, 560 Ohm, ½W, 5% | 1 | Allen Bradley |
| R26, 42, 45 | EB 1021 | RESISTOR, 1 K Ohm, ½W, 10% | 3 | Allen Bradley |
| R23, 27 | EB 1125 | RESISTOR, 1.1 K Ohm, ½W, 5% | 2 | Allen Bradley |
| R22, 34, 37 | EB 2025 | RESISTOR, 2 K Ohm, ½W, 5% | 3 | Allen Bradley |
| R19, 25 | EB 2425 | RESISTOR, 2.4 K Ohm, ½W, 5% | 2 | Allen Bradley |
| R15 | EB 3625 | RESISTOR, 3.6 K Ohm, ½W, 5% | 1 | Allen Bradley |
| R35, 38, 46, 47, 48, 50 | EB 4721 | RESISTOR, 4.7 K Ohm, ½W, 10% | 6 | Allen Bradley |
| R53 | EB 5125 | RESISTOR, 5.1 K Ohm, ½W, 5% | 1 | Allen Bradley |
| R17 | EB 7525 | RESISTOR, 7.5 K Ohm, ½W, 5% | 1 | Allen Bradley |
| R33 | EB 9125 | RESISTOR, 9.1 K Ohm, ½W, 5% | 1 | Allen Bradley |
| R40, 41, 43, 44, 49, 51 | EB 1031 | RESISTOR, 10 K Ohm, ½W, 10% | 6 | Allen Bradley |
| R36, 39 | EB 1531 | RESISTOR, 15 K Ohm, ½W, 10% | 2 | Allen Bradley |
| R52, 54 | EB 2731 | RESISTOR, 27 K Ohm, ½W, 10% | 2 | Allen Bradley |
| R14 | EB 1135 | RESISTOR, 11 K Ohm, ½W, 5% | 1 | Allen Bradley |
| R20 | EB 1305 | RESISTOR, 13 Ohm, ½W, 10% | 1 | Allen Bradley |
| R30 | EB 3005 | RESISTOR, 30 Ohm, ½W, 5% | 1 | Allen Bradley |
| K3 | C 1417–15 | CHOPPER | 1 | Bristol |
| CR1 | 5003–003 | DIODE | 1 | NLS |
| C1 | XK2–682 | CAPACITOR, Polystyrene, .0068 Mfd, 200 VDCW | 1 | Electron |
| C2 | XL2–222 | CAPACITOR, Polystyrene, .0022 Mfd, 200 VDCW | 1 | Electron |
| R12 | 025–OL–1–20 | POTENTIOMETER, 20 Ohm | 1 | Conelco |
| R10 | 025–OL–1–200 | POTENTIOMETER, 200 Ohm | 1 | Conelco |
| R8 | 025–OL–1–2K | POTENTIOMETER, 2 K Ohm | 1 | Conelco |
| R2–7 | PW1719B–15003M | RESISTOR, 1.5 Meg, ½W, .05%, Aqua | 6 | NLS |
| R9 | PW1719B–89902M | RESISTOR, 899 K Ohm, ½W, .05%, Orange | 1 | NLS |
| R11 | PW1719B–89901M | RESISTOR, 89.9 K Ohm, ½W, .05%, Red | 1 | NLS |
| R13 | PW1719B–99910M | RESISTOR, 9.9911 K Ohm, ½W, .05%, Brown | 1 | NLS |
| R1 | GB 1051 | RESISTOR, 1 Meg, 1W, 10% | 1 | Allen Bradley |
| K1, 2 | 5005–003 | RELAY | 2 | NLS |

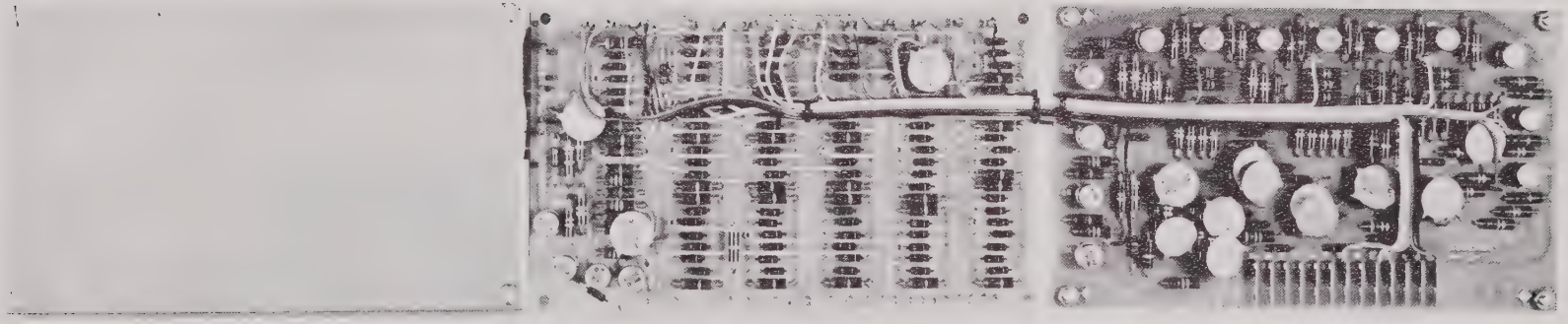


*Figure 37. Programmer Assembly, Open View—Front (see Figures 39, 40, and 41 for parts identification).*

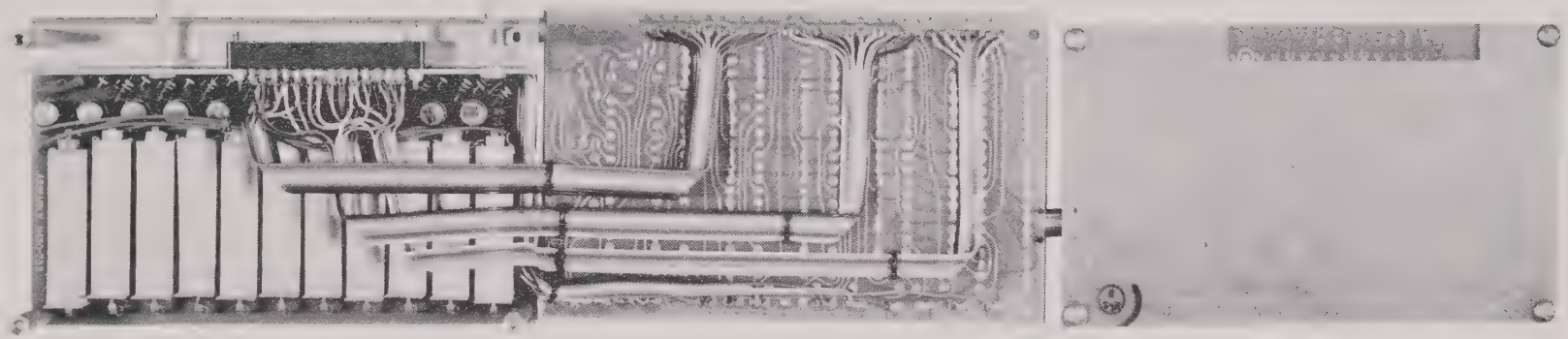
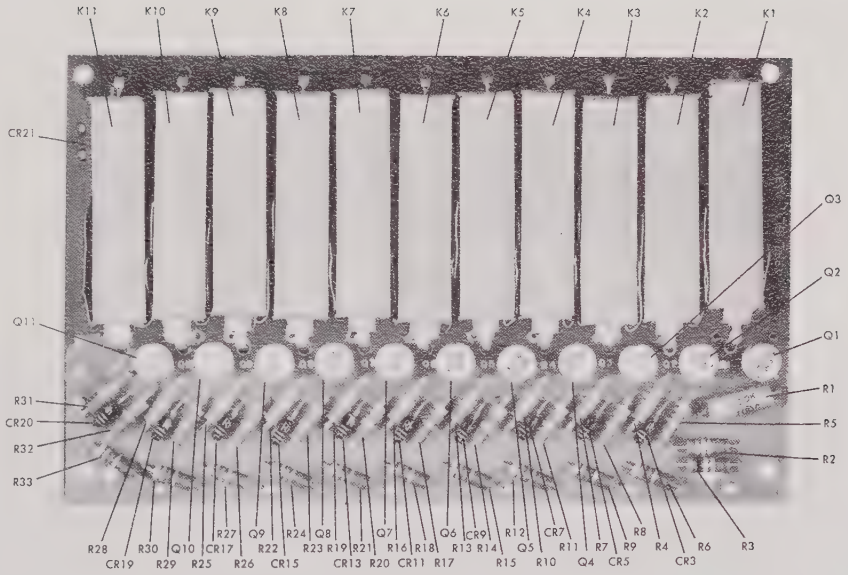


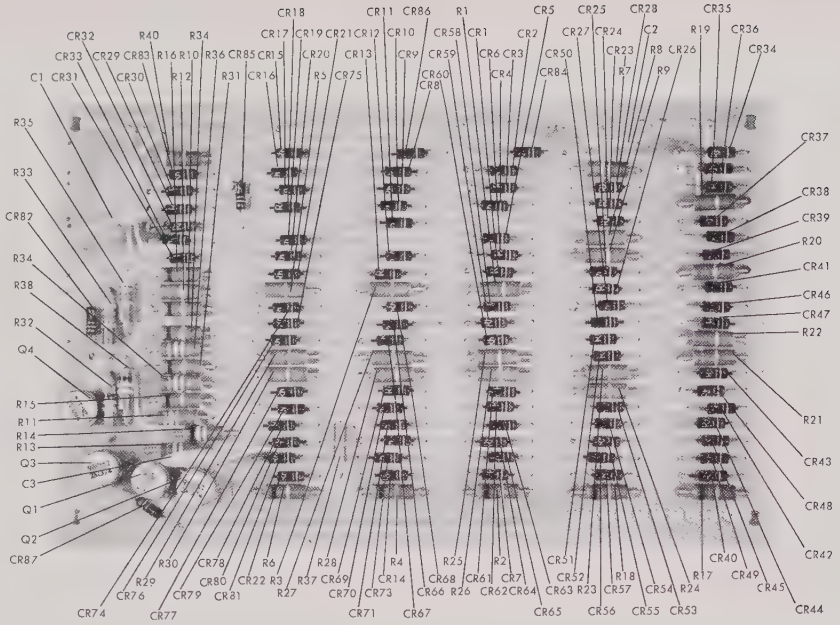
*Figure 38. Programmer, Assembly, Open View—Rear.*




11430–733 BOARD ASSEMBLY RELAY

*Figure 39. Programmer, Relay Board (harness removed).*

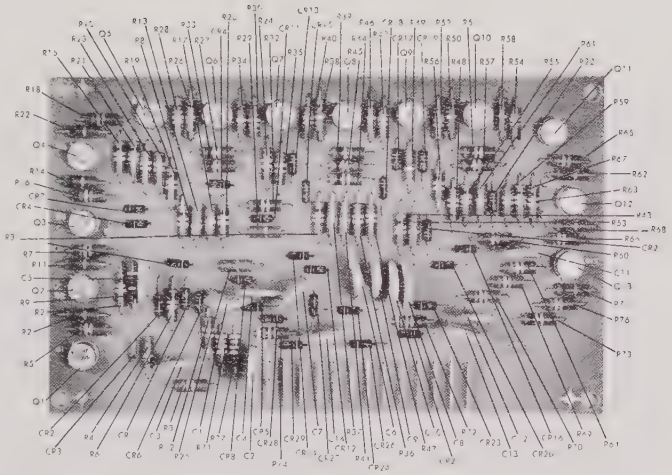
| CIRCUIT REFERENCE | PART NUMBER | DESCRIPTION | QTY PER UNIT | MANUFACTURER |
|---|---|---|---|---|
| R34 | EB1021 | RESISTOR, 1K, ½W, 10% | 1 | Allen Bradley |
| R1 | DCM¼ | RESISTOR, 49.9K, ¼W, 1% | 1 | Electra |
| R2, 4, 7, 10, 13, 16, 19, 22, 25, 28, 31 | EB2731 | RESISTOR, 27K, ½W, 10% | 11 | Allen Bradley |
| R3 | EB1031 | RESISTOR, 10K, ½W, 10% | 1 | Allen Bradley |
| R5, 6, 8, 9, 11, 12, 14, 15, 17, 18, 20, 21, 23, 24, 26, 27, 29, 30, 32, 33 | EB4721 | RESISTOR, 4.7K, ½W, 10% | 20 | Allen Bradley |
| CR1–21 | 5003–002 | DIODE | 21 | NLS |
| Q1–11 | 2N1374 | TRANSISTOR | 11 | T.I. |
| K1 | CRZ1061 | RELAY, Reed | 1 | C. P. Clare |
| K2–11 | RP12450–G2 | RELAY, Reed | 10 | C. P. Clare |




11430–734 MATRIX BOARD

*Figure 40. Programmer, Matrix Board (harness removed).*

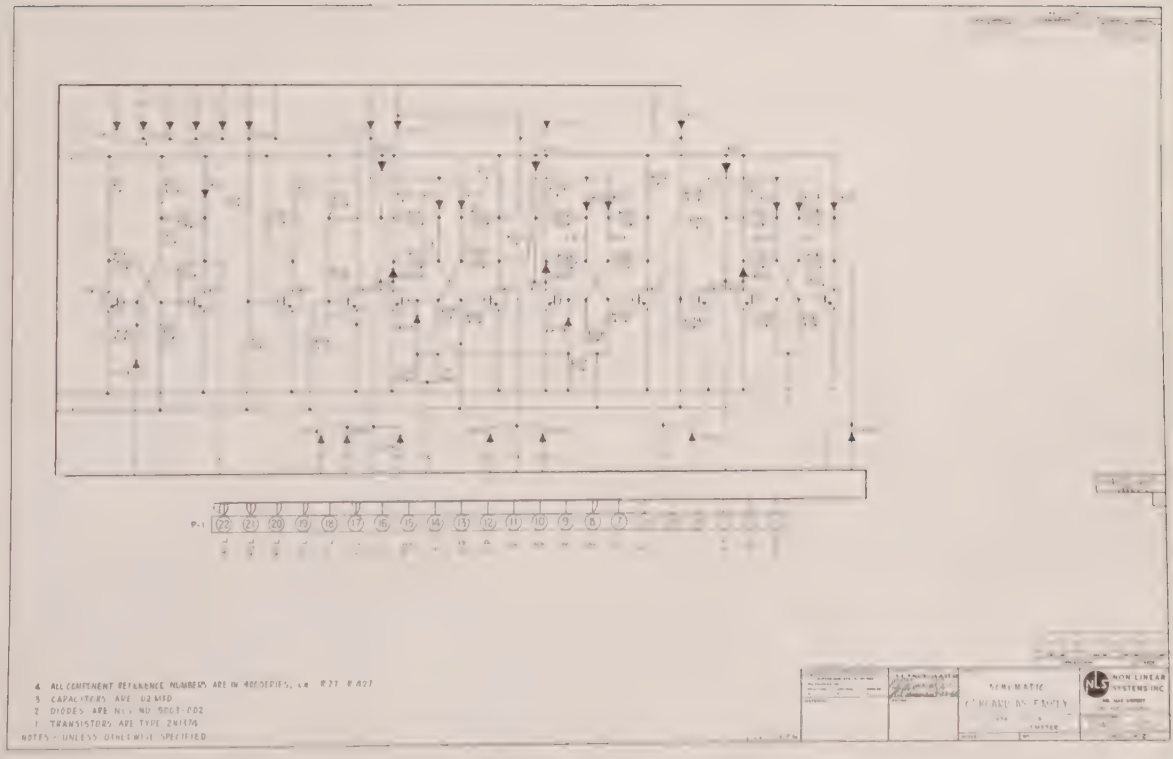
| CIRCUIT REFERENCE | PART NUMBER | DESCRIPTION | QTY PER UNIT | MANUFACTURER |
|---|---|---|---|---|
| C1–C3 | BT.02 | CAPACITOR, .02 Mfd., ±20% | 3 | R.M.C. |
| R7 | EB2241 | RESISTOR, 220K, ½W, 10% | 1 | Allen Bradley |
| R11, 13, 34, 36 | EB2731 | RESISTOR, 27K, ½W, 10% | 4 | Allen Bradley |
| R14, 32, 38 | EB1031 | RESISTOR, 10K, ½W, 10% | 3 | Allen Bradley |
| R33, 35, 40 | EB4721 | RESISTOR, 4.7K, ½W, 10% | 3 | Allen Bradley |
| R1, 3, 5, 8, 9, 19–30, 37, 12 | EB2221 | RESISTOR, 2.2K, ½W, 10% | 19 | Allen Bradley |
| R2, 4, 6, 10, 15, 16, 17, 18, 31, 39 | EB1021 | RESISTOR, 1K, ½W, 10% | 10 | Allen Bradley |
| CR1–CR87 | 5003–002 | DIODE | 87 | NLS |
| Q1–Q4 | 2N1374 | TRANSISTOR | 4 | T.I. |



11430–731 COUNTER BOARD

*Figure 41. Programmer, Counter Board (harness removed).*

| CIRCUIT REFERENCE | PART NUMBER | DESCRIPTION | QTY PER UNIT | MANUFACTURER |
|---|---|---|---|---|
| C1–C14 | BT.02 | CAPACITOR, .02 Mfd., ±20% | 14 | Radio Mat'ls. Co. |
| R10, 12, 23, 24, 35, 36, 47, 48, 59, 60 | EB2241 | RESISTOR, 220K, ½W, 10% | 10 | Allen Bradley |
| R71, 72, 77, 74 | EB4731 | RESISTOR, 47K, ½W, 10% | 4 | Allen Bradley |
| R3, 5, 7, 16, 18, 28, 30, 40, 42, 52, 54, 64, 65, 66, 69, 70, 76 | EB2731 | RESISTOR, 27K, ½W, 10% | 17 | Allen Bradley |
| R2, 6, 8, 15, 19, 20, 21, 27, 31, 32, 33, 39, 43, 44, 45, 51, 55, 56, 57, 63, 67, 73 | EB1031 | RESISTOR, 10K, ½W, 10% | 22 | Allen Bradley |
| R9 | EB4721 | RESISTOR, 4.7K, ½W, 10% | 1 | Allen Bradley |
| R4, 13, 17, 25, 29, 37, 41, 49, 53, 61 | EB2221 | RESISTOR, 2.2K, ½W, 10% | 10 | Allen Bradley |
| R1, 11, 14, 22, 26, 34, 38, 46, 50, 58, 62, 68, 75 | EB1021 | RESISTOR, 1K, ½W, 10% | 13 | Allen Bradley |
| CR3 | ¼M6.8Z | DIODE, Zener | 1 | Motorola |
| CR1, 2, 4–29 | 5003–002 | DIODE | 28 | NLS |
| Q1–Q13 | 2N1374 | TRANSISTOR | 13 | T.I. |


4. ALL COMPONENT REFERENCE NUMBERS ARE IN 400 SERIES, i.e. R27 = R427
3. CAPACITORS ARE .02 MFD
2. DIODES ARE NCL ND 9003-002
1. TRANSISTORS ARE TYPE 2N1613
NOTES - UNLESS OTHERWISE SPECIFIED
SCHEMATIC
NON LINEAR SYSTEMS INC

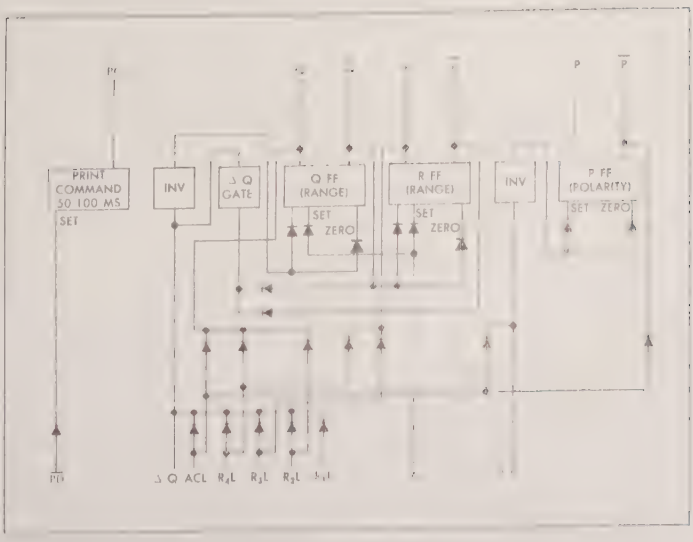



*Figure 32. C Board Block Diagram.*

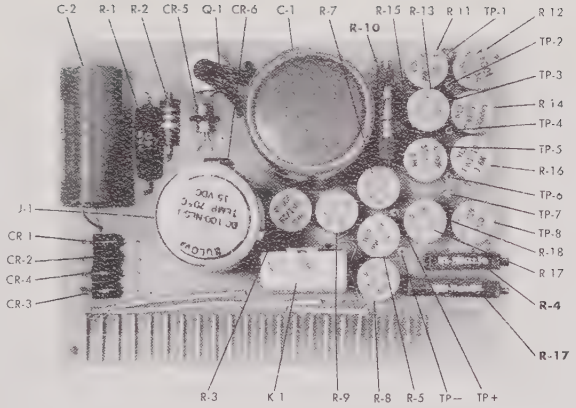
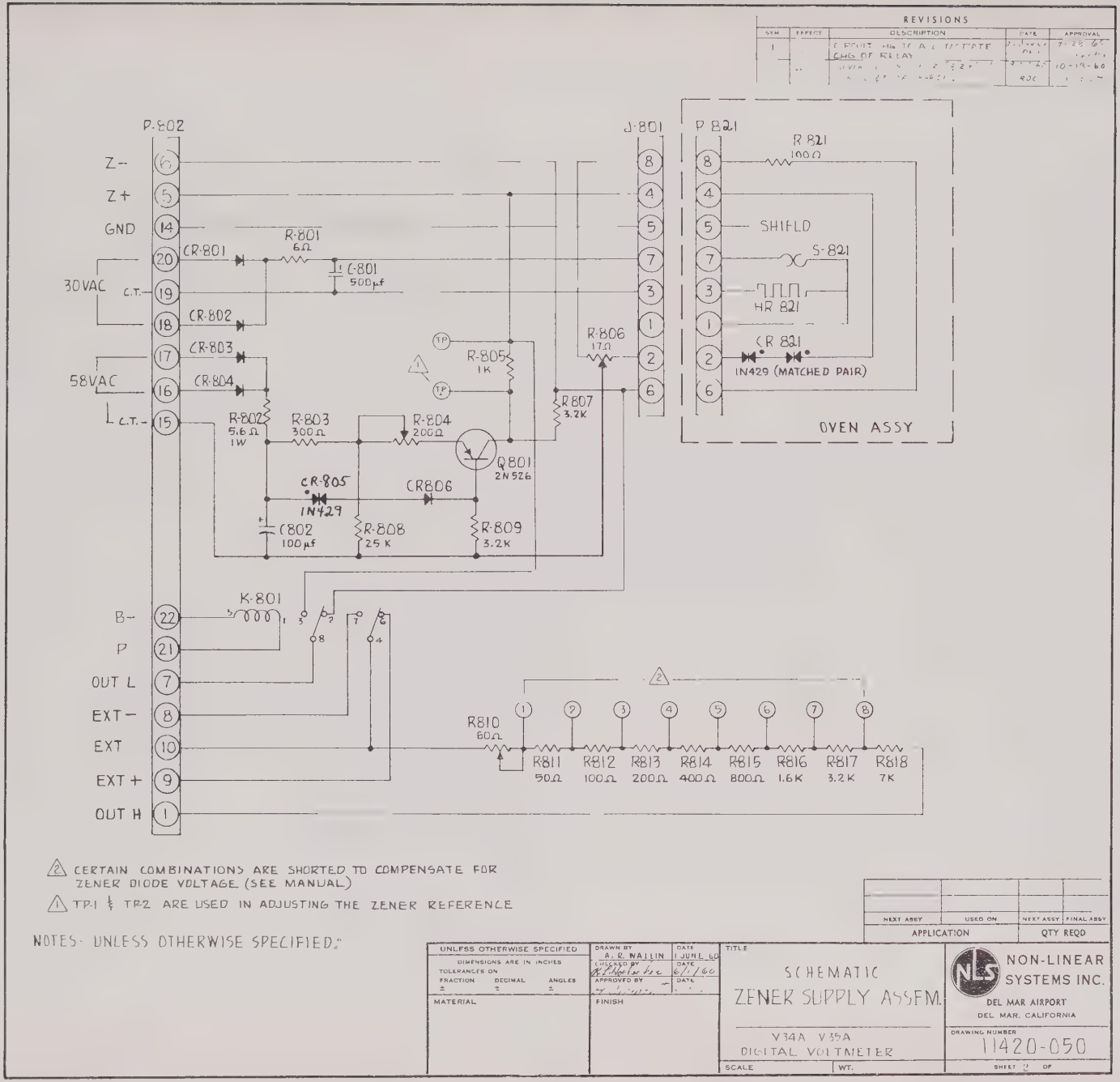



*Figure 42. Zener Reference Voltage Supply Board.*

| CIRCUIT REFERENCE | PART NUMBER | DESCRIPTION | QTY PER UNIT | MANUFACTURER |
|---|---|---|---|---|
| K1 | 5005–003 | RELAY | 1 | NLS |
| C2 | 05RM100 | CAPACITOR, Elect., 100 Mfd., 50 VDCW | 1 | Ind. Cond. |
| C1 | 05RTP500 | CAPACITOR, Elect., 500 Mfd., 50 VDCW | 1 | Ind. Cond. |
| R4 | W5–P2–200 | POTENTIOMETER, 200 Ohm, 10% | 1 | Atohm |
| R10 | W101–P1–60 | POTENTIOMETER, 60 Ohm, 10% | 1 | Atohm |
| R6 | 2420–17 | POTENTIOMETER, 17 Ohm, 10% | 1 | Conelco |
| R8 | PW1719 | RESISTOR, 25K Ohm, ½ W, 1% | 1 | NLS |
| R18 | PW1719 | RESISTOR, 7K Ohm, ½ W, .05% | 1 | NLS |
| R17 | PW1719 | RESISTOR, 3.2K Ohm, ½ W, .05% | 1 | NLS |
| R7, R9 | PW1719 | RESISTOR, 3.2K Ohm, ½ W, .25% | 2 | NLS |
| R16 | PW1719 | RESISTOR, 1.6K Ohm, ½ W, .1% | 1 | NLS |
| R5 | PW1719 | RESISTOR, 1K Ohm, ½ W, .25% | 1 | NLS |
| R15 | PW1719 | RESISTOR, 800 Ohm, ½ W, .1% | 1 | NLS |
| R14 | PW1719 | RESISTOR, 400 Ohm, ½ W, .25% | 1 | NLS |
| R3 | PW1719 | RESISTOR, 300 Ohm, ½ W, .25% | 1 | NLS |
| R13 | PW1719 | RESISTOR, 200 Ohm, ½ W, .25% | 1 | NLS |
| R12 | PW1719 | RESISTOR, 100 Ohm, ½ W, .5%, ⅜" Leads | 1 | NLS |
| R11 | PW1719 | RESISTOR, 50 Ohm, ½ W, 1% | 1 | NLS |
| R2 | GB56G1 | RESISTOR, 5.6 Ohm, 1W, 10% | 1 | AB |
| R1 | PRC 5A | RESISTOR, .6 Ohm, 5W, 1% | 1 | PRC |
| Q1 | 2N526 | TRANSISTOR | 1 | G.E. |
| CR5 | 1N429 | DIODE | 1 | Hoffman |
| CR1, 2, 3, 4, 6 | 1N2616 | DIODE | 5 | Motorola |
| | 11420–054 | ZENER OVEN SUB-ASSY. | 1 | NLS |


REVISIONS
SYM
EFFECT
DESCRIPTION
DATE
APPROVAL
P-802
J-801
P 821
Z-
Z+
GND
30VAC C.T.
58VAC C.T.
B-
P
OUT L
EXT-
EXT
EXT+
OUT H
CR-801
CR-802
CR-803
CR-804
R-801 6Ω
C-801 500µf
R-802 5.6Ω 1W
R-803 300Ω
R-804 200Ω
R-805 1K
R-806 17Ω
R-807 3.2K
Q801 2N526
CR-805 IN429
CR806
C802 100µf
R-808 25K
R-809 3.2K
K-801
R 821 100Ω
SHIELD
S-821
HR 821
CR 821
IN429 (MATCHED PAIR)
OVEN ASSY
R810 60Ω
R811 50Ω
R812 100Ω
R813 200Ω
R814 400Ω
R815 800Ω
R816 1.6K
R817 3.2K
R818 7K
2 CERTAIN COMBINATIONS ARE SHORTED TO COMPENSATE FOR ZENER DIODE VOLTAGE. (SEE MANUAL)
1 TP-1 & TP-2 ARE USED IN ADJUSTING THE ZENER REFERENCE
NOTES: UNLESS OTHERWISE SPECIFIED.
NEXT ASSY
USED ON
NEXT ASSY
FINAL ASSY
APPLICATION
QTY REQD
UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ON
FRACTION
DECIMAL
ANGLES
MATERIAL
FINISH
DRAWN BY A. R. WALLIN
DATE 1 JUNE 60
CHECKED BY
DATE 6/1/60
APPROVED BY
DATE
TITLE
SCHEMATIC
ZENER SUPPLY ASSEM.
V34A V35A
DIGITAL VOLTMETER
NON-LINEAR SYSTEMS INC.
DEL MAR AIRPORT
DEL MAR, CALIFORNIA
DRAWING NUMBER
11420-050
SCALE
WT.
SHEET 1 OF

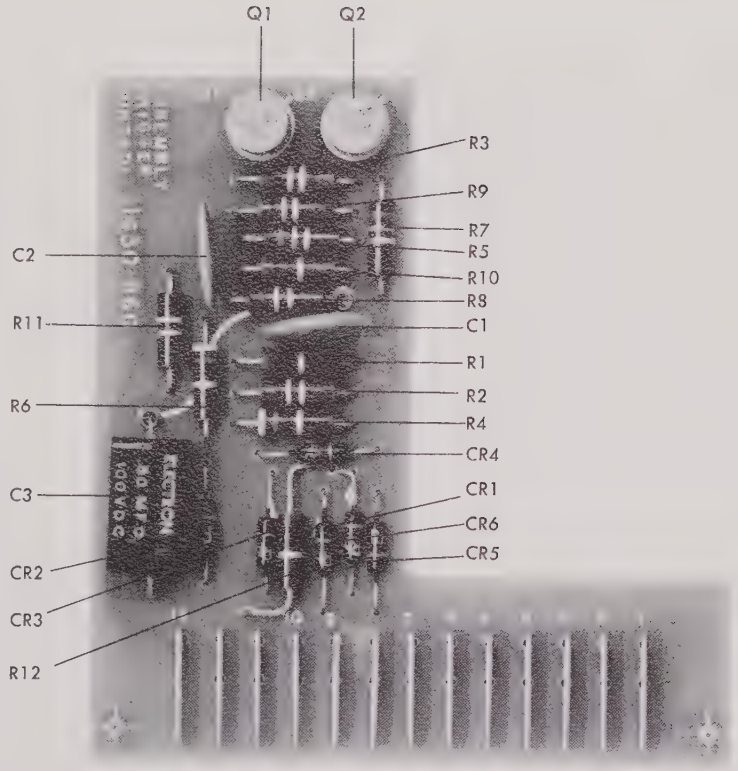
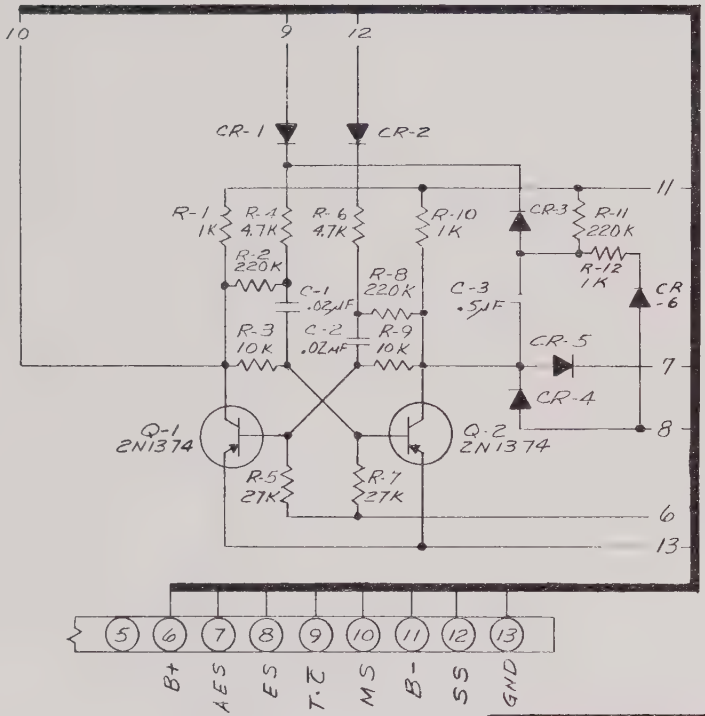



*Figure 43. Trigger Control Board.*

| CIRCUIT REFERENCE | PART NUMBER | DESCRIPTION | QTY PER UNIT | MANUFACTURER |
|---|---|---|---|---|
| C3 | ME1–504E | CAPACITOR, 5 Mfd., 100 VDC, Metalized Paper | 1 | Electron |
| C1, C2 | BT.02 | CAPACITOR, .02 Mfd., ± 20% | 2 | R.M.C. |
| R2, R8, R11 | EB2241 | RESISTOR, 220K, ½ W, 10% | 3 | Allen Bradley |
| R5, R7 | EB2731 | RESISTOR, 27K, ½ W, 10% | 2 | Allen Bradley |
| R3, R9 | EB1031 | RESISTOR, 10K, ½ W, 10% | 2 | Allen Bradley |
| R4, R6 | EB4721 | RESISTOR, 4.7K, ½ W, 10% | 2 | Allen Bradley |
| R1, R10, R12 | EB1021 | RESISTOR, 1K, ½ W, 10% | 3 | Allen Bradley |
| CR1-CR6 | 5003–002 | DIODE | 6 | NLS |
| Q1, Q2 | 2N1374 | TRANSISTOR | 2 | T.I. |

11430-860 SHEET 2 | 1

| REVISIONS | | | | |
|---|---|---|---|---|
| SYM | EFFECT. | DESCRIPTION | DATE | APPROVAL |
| 1 | ALL | ADDED R-12 | 1-10-62 | R.L.H. |




| NEXT ASSY | USED ON | NEXT ASSY | FINAL ASSY |
|---|---|---|---|
| APPLICATION | | QTY REQD | |

| UNLESS OTHERWISE SPECIFIED | DRAWN BY | DATE |
|---|---|---|
| DIMENSIONS ARE IN INCHES | R Colletta | 8-7-61 |
| TOLERANCES ON | CHECKED BY | DATE |
| FRACTION ± DECIMAL ± ANGLES ± | R. Collier | 9-7-61 |
| | APPROVED BY | DATE |
| | R. [illegible] | 1-7-61 |
| MATERIAL | FINISH | |

TITLE: SCHEMATIC - TRIGGER CONTROL BOARD

MODELS V34B/V35B

NON-LINEAR SYSTEMS INC.
DEL MAR AIRPORT
DEL MAR, CALIFORNIA

DRAWING NUMBER 11430-860

SCALE | WT. | SHEET 2 OF 2

1. DIODES ARE NLS TYPE 5003-002.
NOTES: UNLESS OTHERWISE SPECIFIED

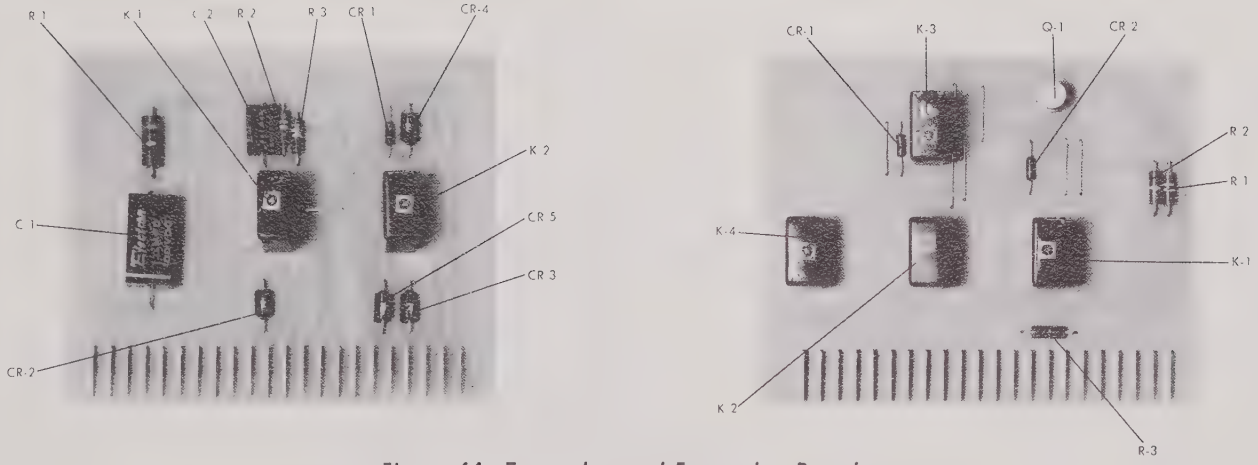


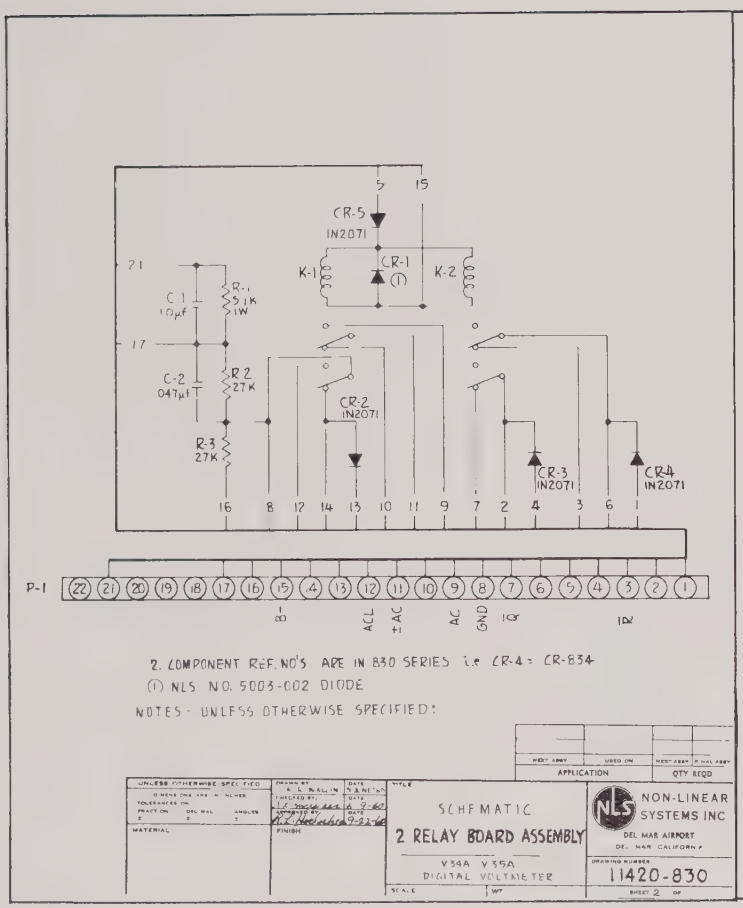

*Figure 44. Two-relay and Four-relay Boards.*

11420–830 ASSEMBLY, 2-RELAY

| CIRCUIT REFERENCE | PART NUMBER | DESCRIPTION | QTY PER UNIT | MANUFACTURER |
|---|---|---|---|---|
| K1, K2 | 5005–002 | RELAY | 2 | NLS |
| R2, R3 | EB2731 | RESISTOR, 27K, ½ W, 10% | 1 | Allen Bradley |
| R1 | GB5125 | RESISTOR, 5.1 K, 1W, 5% | 1 | Allen Bradley |
| C1 | ME1–105 | CAPACITOR, Metalized Paper, 1 Mfd., 100 VDC | 1 | Electron |
| C2 | ME2–473E | CAPACITOR, Metalized Paper, .047 Mfd., 200 VDC | 1 | Electron |
| CR2-CR5 | 1N2616 | DIODE | 4 | Motorola |
| CR1 | 5003–002 | DIODE | 1 | NLS |

11420–800 4-RELAY BOARD

| CIRCUIT REFERENCE | PART NUMBER | DESCRIPTION | QTY PER UNIT | MANUFACTURER |
|---|---|---|---|---|
| K1–K4 | 5005–002 | RELAY | 4 | NLS |
| R1 | EB1031 | RESISTOR, 10K, ½ W, 10% | 1 | Allen Bradley |
| R2 | EB2221 | RESISTOR, 2.2K, ½ W, 10% | 1 | Allen Bradley |
| R3 | EB1021 | RESISTOR, 1K, ½ W, 10% | 1 | Allen Bradley |
| CR1, CR2 | 5003–002 | DIODE | 2 | NLS |
| Q1 | 2N1374 | TRANSISTOR | 1 | T.I. |




2. COMPONENT REF. NO'S ARE IN 830 SERIES i.e CR-4 = CR-834

(1) NLS NO. 5003-002 DIODE

NOTES - UNLESS OTHERWISE SPECIFIED:

| NEXT ASSY | USED ON | NEXT ASSY | FINAL ASSY |
|---|---|---|---|
| APPLICATION | | QTY REQD | |

UNLESS OTHERWISE SPECIFIED — DIMENSIONS ARE IN INCHES — TOLERANCES ON FRACTION DEC MAL ANGLES — MATERIAL — FINISH

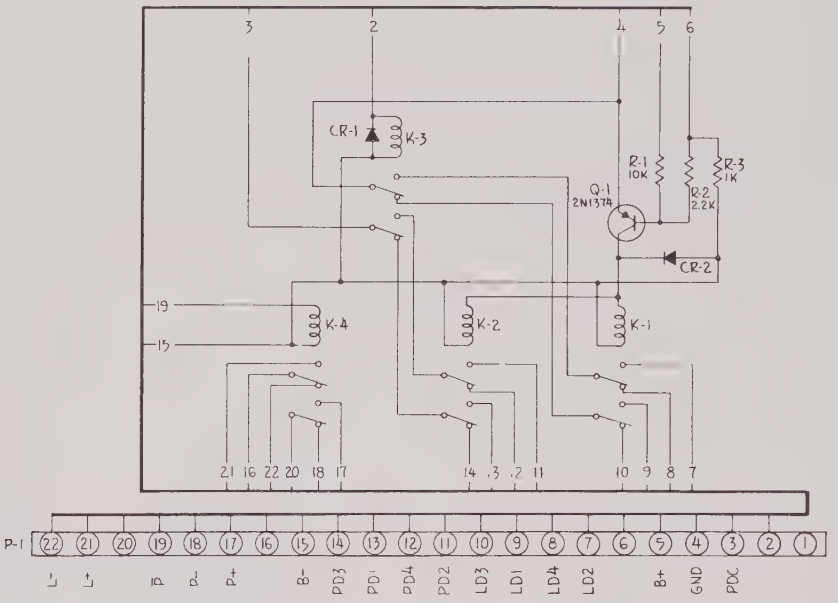
DRAWN BY A. E. WALLIN — TRACED BY — DESIGNED BY — CHECKED BY — APPROVED BY

TITLE: SCHEMATIC
2 RELAY BOARD ASSEMBLY
V34A V35A
DIGITAL VOLTMETER

NON-LINEAR SYSTEMS INC
DEL MAR AIRPORT
DEL MAR CALIFORNIA

DRAWING NUMBER: 11420-830

SCALE — WT — SHEET 2 OF




2. COMPONENT REF NO'S ARE IN 800 SERIES - i.e. R-3 = R-803

1 DIODES ARE NLS NO 5003-002

NOTES - UNLESS OTHERWISE SPECIFIED:

| NEXT ASSY | USED ON | NEXT ASSY | FINAL ASSY |
|---|---|---|---|
| APPLICATION | | QTY REQD | |

UNLESS OTHERWISE SPECIFIED — DIMENSIONS ARE IN INCHES — TOLERANCES ON FRACTION DEC MAL ANGLES — MATERIAL — FINISH

DRAWN BY A. E. WALLIN — TRACED BY — DESIGNED BY — CHECKED BY — APPROVED BY

TITLE: SCHEMATIC—
4 RELAY BOARD ASSEMBLY
V34A V35A
DIGITAL VOLTMETER

NON-LINEAR SYSTEMS INC
DEL MAR AIRPORT
DEL MAR CALIFORNIA

DRAWING NUMBER: 11420-800

SCALE — WT — SHEET 2 OF

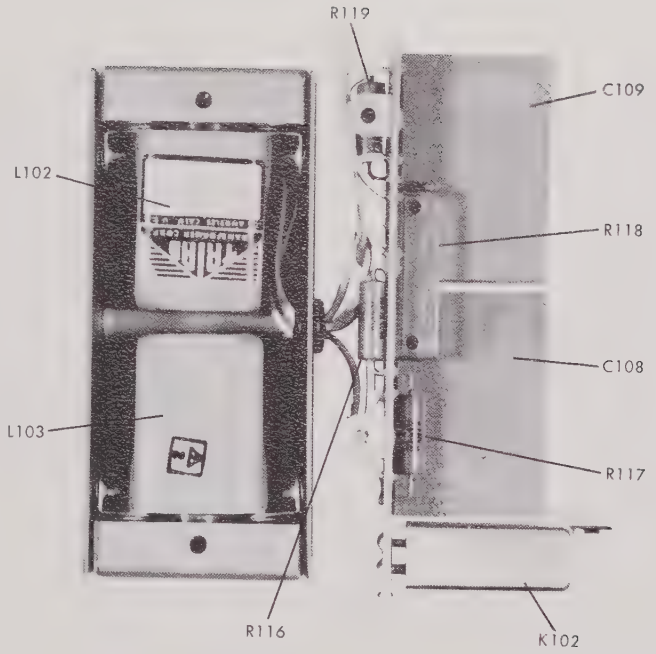


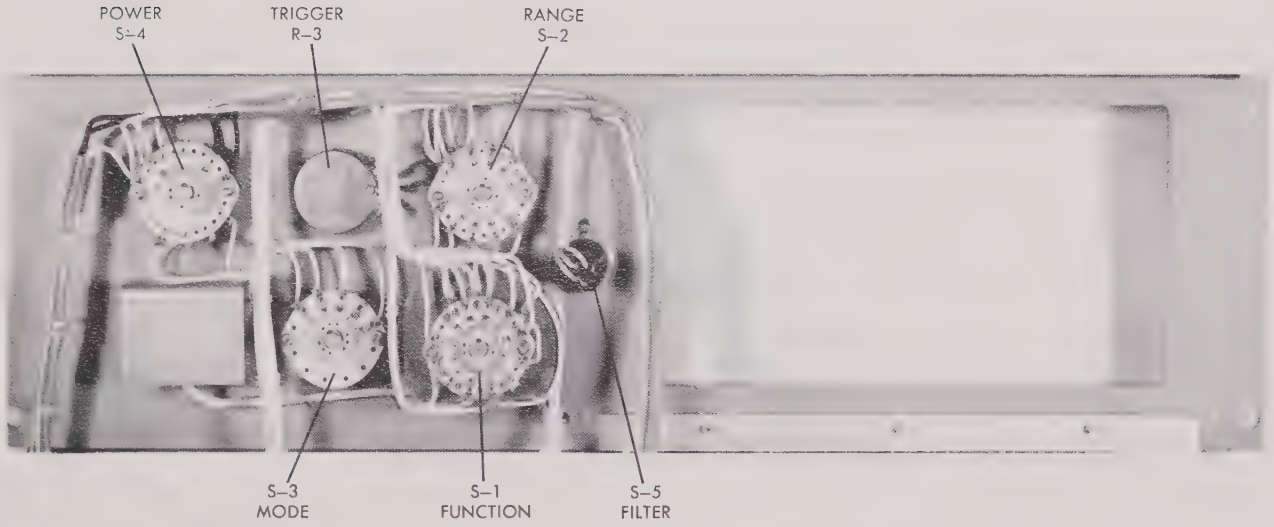

*Figure 45. Input Filter.*

11430–150 FILTER ASSEMBLY

| CIRCUIT REFERENCE | PART NUMBER | DESCRIPTION | QTY PER UNIT | MANUFACTURER |
|---|---|---|---|---|
| K102 | 5005–003 | RELAY | 1 | Babcock |
| L102–3 | 15594 | CHOKE | 2 | Triad |
| C108–9 | ZDP–1816 | CAPACITOR, 1 Mfd., 1 KV | 2 | Elpac |
| R116 | MDB | RESISTOR, 27.4K, ¼ W DC | 1 | IRC |
| R117 | MDB | RESISTOR, 12.7K, ¼ W DC | 1 | IRC |
| R119 | MDB | RESISTOR, 10K, ¼ W DC | 1 | IRC |
| R118 | 275–202 | POTENTIOMETER, 2K | 1 | Bourns |

SEE SCHEMATIC 11530-100

ON PAGE 55




11530–100 FACADE, MAIN BOARD ASSEMBLY; SEE ALSO PAGE 58.

| CIRCUIT REFERENCE | PART NUMBER | DESCRIPTION | QTY PER UNIT | MANUFACTURER |
|---|---|---|---|---|
| R3 | 11420–111 | POTENTIOMETER, Trigger Level | 1 | NLS |
| S1 | 11420–122 | SWITCH, Function | 1 | NLS |
| S2 | 11420–123 | SWITCH, Range | 1 | NLS |
| S3 | 11420–121 | SWITCH, Mode | 1 | NLS |
| S4 | 11420–120 | SWITCH, Power | 1 | NLS |
| S5 | WC 1868 | SWITCH, Input Filter | 1 | NLS |

11420-400 C BOARD

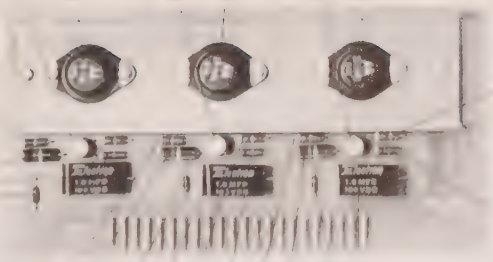


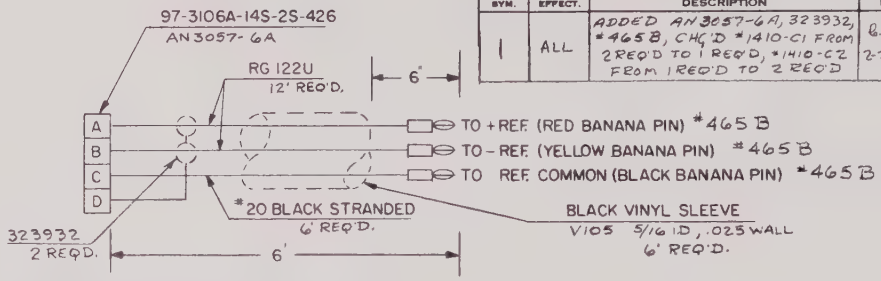
*Figure 33 D Board (Instrument uses Two D Boards)*

11420-500 D BOARD

| CIRCUIT REFERENCE | PART NUMBER | DESCRIPTION | QTY PER UNIT | MANUFACTURER |
|---|---|---|---|---|
| C1, C2, C3 | ME1-105 | CAPACITOR, Met. Paper, 1 Mfd. | | |
| R2, R3, R6, R7, R10, R11 | EB4721 | RESISTOR, 4.7K Ohm, ½ W, 1% | | |
| R4, R8, R12 | EB1021 | RESISTOR, 1K Ohm, ¼ W, 10% | | |
| R1, R5, R9 | | RESISTOR, 100 Ohm, 1W | | |
| CR1, CR2, CR3 | | DIODE | | |
| Q2, Q4, Q6 | 2N | TRANSISTOR | | |
| Q1, Q3, Q5 | 2N1374 | TRANSISTOR | | |

DRAWING NUMBER 15004-125 | 1

| REVISIONS | | | | |
|---|---|---|---|---|
| SYM. | EFFECT. | DESCRIPTION | DATE | APPROVAL |
| 1 | ALL | ADDED AN3057-6A, 323932, #465B, CHG'D #1410-C1 FROM 2 REQ'D TO 1 REQ'D, #1410-C2 FROM 1 REQ'D TO 2 REQ'D | B.B.M. 2-2-62 | I. THOMSON 2-2-62 |




| QTY. | INCLUDED WITH THIS CABLE |
|---|---|
| 1 | #1410-C1 SAFE-T-KLIP - BLACK |
| 2 | #1410-C2 SAFE-T-KLIP - RED |
| 3 | #332-A SPADE LUGS, BIRNBACH |
| | |

| NEXT ASSY | USED ON | NEXT ASSY | FINAL ASSY |
|---|---|---|---|
| 11367 | 11367 | | |
| 11520 | 11520 | 1 | 1 |
| 11420 | 11420 | 1 | 1 |

| H4-03626 | APPLICATION | QTY REQD |
|---|---|---|

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ON
FRACTION ± | DECIMAL ± | ANGLES ±

MATERIAL

FINISH

DRAWN BY R. COLLIER (MS) DATE 8-1-60
CHECKED BY R. L. H. DATE 8-1-60
APPROVED BY R. Hoelscher DATE 8-1-60

TITLE: CABLE, EXTERNAL REFERENCE

SCALE | WT.

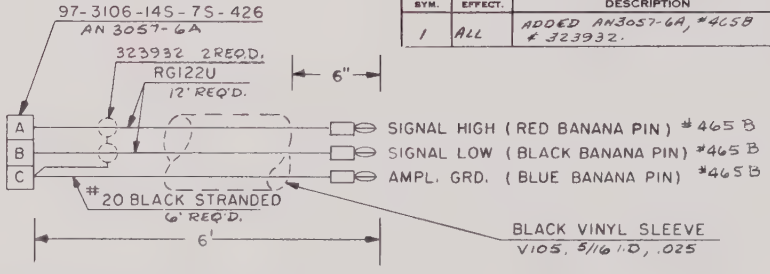
NON-LINEAR SYSTEMS INC.
DEL MAR AIRPORT
DEL MAR, CALIFORNIA

DRAWING NUMBER 15004-125

SHEET OF

DRAWING NUMBER 15004-126 | 1

| REVISIONS | | | | |
|---|---|---|---|---|
| SYM. | EFFECT. | DESCRIPTION | DATE | APPROVAL |
| 1 | ALL | ADDED AN3057-6A, #465B #323932. | 2-5-62 | I. THOMSON |




| QTY | INCLUDED WITH THIS CABLE |
|---|---|
| 1 | # 1410-C1 SAFE-T-KLIP BLACK |
| 1 | # 1410-C2 SAFE-T-KLIP RED |
| 3 | # 332-A SPADE LUGS, BIRNBACH |
| 1 | # 31 ALLIGATOR CLIP, BIRNBACH |

| NEXT ASSY | USED ON | NEXT ASSY | FINAL ASSY |
|---|---|---|---|
| 11367 | 11367 | 1 | 1 |
| 11520 | 11520 | 1 | 1 |
| 11420 | 11420 | 1 | 1 |

| H4-03626 | APPLICATION | QTY REQD |
|---|---|---|

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ON
FRACTION ± 1/2" | DECIMAL ± — | ANGLES ± —

MATERIAL: NOTED

FINISH

DRAWN BY R. COLLIER (M.S.) DATE 8-1-60
CHECKED BY R. L. H. DATE 8-1-60
APPROVED BY R. Hoelscher DATE 8-1-60

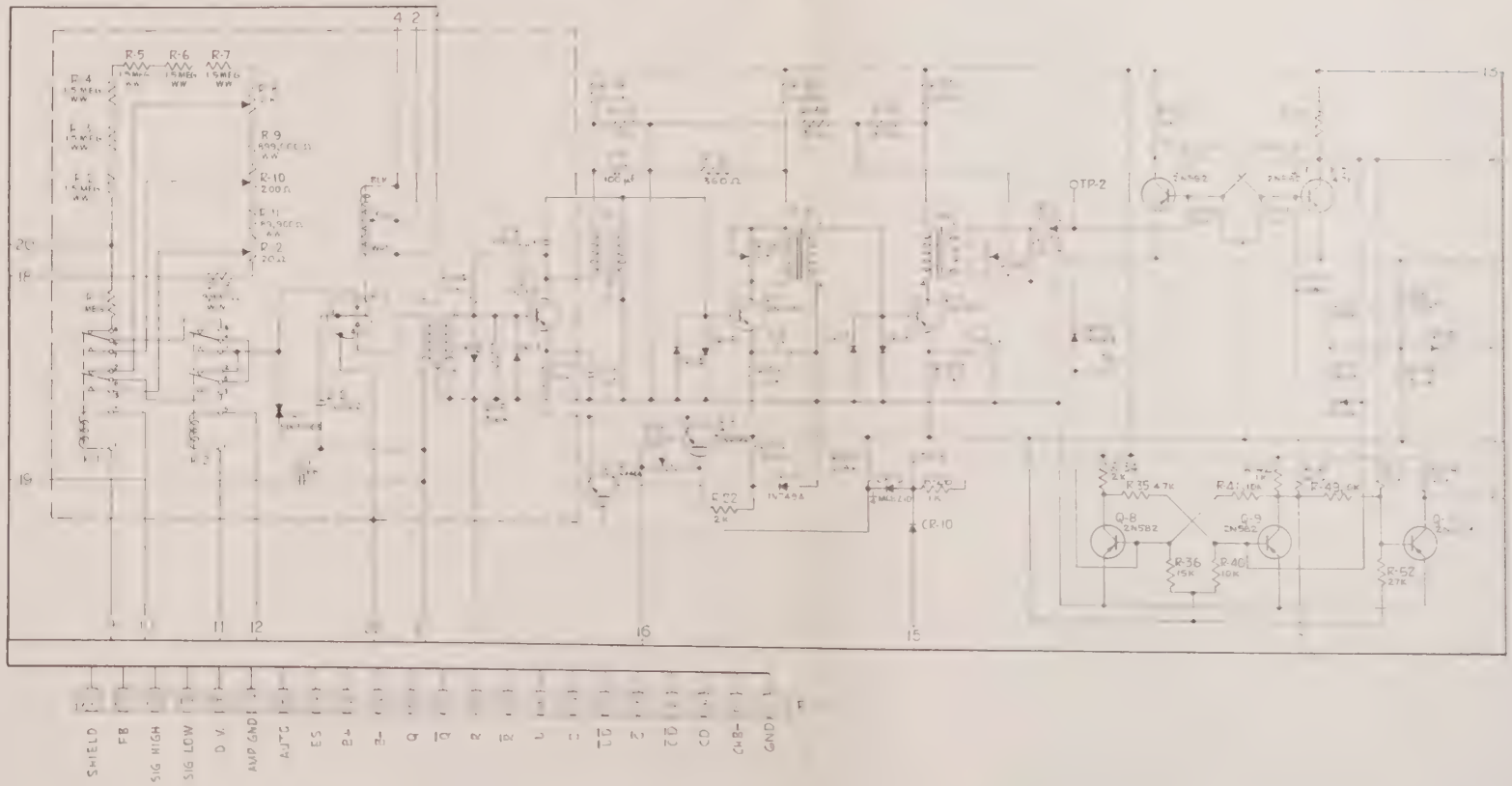
TITLE: CABLE, INPUT

SCALE NONE | WT.

NON-LINEAR SYSTEMS INC.
DEL MAR AIRPORT
DEL MAR, CALIFORNIA

DRAWING NUMBER 15004-126

SHEET 1 OF 1




⚠ SELECTED FOR LOW NOISE.
3 ALL COMPONENT REF. NUMBERS ARE IN THE 600 SERIES, i.e. R-1 - R-601
2 DIODES ARE TYPE 1N3-082.
1. CAPACITOR VALUE IS IN MICROFARADS.
NOTES: UNLESS OTHERWISE SPECIFIED:

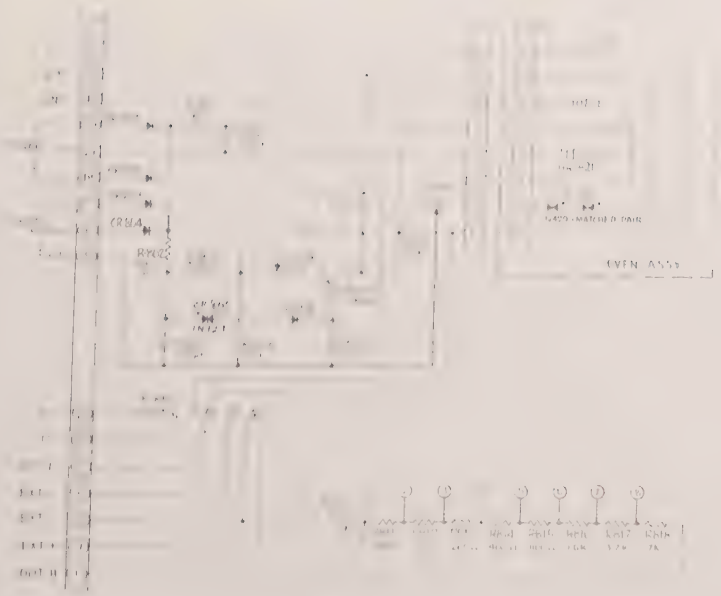
SCHEMATIC -
AMPLIFIER ED ASSEM.
V-44A V-45A
E TAL VOLTMETER

NLS NON-LINEAR SYSTEMS INC

11530–100 MAIN BOARD; SEE ALSO PAGE 54.

| CIRCUIT REFERENCE | PART NUMBER | DESCRIPTION | QTY PER UNIT | MANUFACTURER |
|---|---|---|---|---|
| L101 | 11400–108 | CHOKE | 1 | NLS |
| T101 | 11420–109 | TRANSFORMER, Power | 1 | NLS |
| CR109 | 3/4M8.2Z5 | DIODE, Zener ¾ W | 1 | Motorola |
| CR107, CR108 | 1N2616 | RECTIFIER | 2 | Motorola |
| CR105, CR106 | 1N1124R | RECTIFIER | 2 | T.I. |
| CR112, CR116 | 5003–002 | DIODE | 5 | NLS |
| R101 | EB4721 | RESISTOR, 4.7K, ½ W, 10% | 1 | Allen Bradley |
| R108, R109, R110 | | RESISTOR, .6 Ohm, 5W, 1% | 3 | P.R.C. |
| R111 | GB39G1 | RESISTOR, 3.9 Ohm, 1W, 10% | 1 | Allen Bradley |
| R112 | GB9101 | RESISTOR, 75 Ohm, 2W, 10% | 1 | Allen Bradley |
| C107 | ME2–105 | CAPACITOR, 1 Mfd., 200 VDCW | 1 | Electron |
| C102 | 5002–002 | CAPACITOR | 1 | NLS |
| C101 | 52RM25 | CAPACITOR, 25 Mfd., 25 VDCW | 1 | Ind. Cond. |
| C103, C106 | 1B1246A | CAPACITOR, 4000 Mfd., 25 VDCW | 2 | Ind. Cond. |
| C104, C105 | 1B1249 | CAPACITOR, 3X250 Mfd., 50 VDCW | 1 | Ind. Cond. |
| K101 | KRP–11D | RELAY | 1 | P.B. |

| CIRCUIT REFERENCE | PART NUMBER | DESCRIPTION | PER UNIT | MANUFACTURER |
|---|---|---|---|---|
| T1 | 11420-607 | TRANSFORMER, Isolation | 1 | NLS |
| T2 | 11420-608 | TRANSFORMER, Input | 1 | NLS |
| T3 | 11420-609 | TRANSFORMER, Interstage | 1 | NLS |
| T4 | 11420-610 | TRANSFORMER, Output | 1 | NLS |
| Q1, 2, 3 | 2N1301 | TRANSISTOR | 3 | RCA |
| Q6, 7, 8, 9 | 2N582 | TRANSISTOR | 4 | RCA |
| Q10 | 2N1374 | TRANSISTOR | 1 | TI |
| Q4, 5 | 2N444A | TRANSISTOR | 2 | GT |
| CR11, 12 | 1N662 | DIODE | 2 | Transitron |
| CR2-5, 7, 8, 10, 13, 14, 15 | 5003-002 | DIODE | 10 | NLS |
| CR6 | 1N749A | DIODE | 1 | TI |
| CR9 | 1/4M6.8Z10 | DIODE | 1 | Motorola |
| C5, 7 | TE 1135 | CAPACITOR, Electrolytic, 100 Mfd, 12 VDCW | 2 | Sprague |
| C4 | 5002-001 | CAPACITOR | 1 | NLS |
| C6 | ME1-105 | CAPACITOR, Metalized Paper, 1 Mfd, 100 VDCW | 1 | Electron |
| C8 | ME1-254E | CAPACITOR, Metalized Paper, .25 Mfd, 10%, 100 VDCW | 1 | Electron |
| C3 | DD391 | CAPACITOR, Ceramic, 390 Mfd, 10%, 1000 VDCW | 1 | Centralab |
| R16 | 275-1-501 | POTENTIOMETER, 500 Ohm | 1 | Bourns |
| R28 | 275-1-102 | POTENTIOMETER, 1 K Ohm | 1 | Bourns |
| R18 | 275-1-202 | POTENTIOMETER, 2 K Ohm | 1 | Bourns |
| R31 | EB 1615 | RESISTOR, 160 Ohm, 1/2 W, 5% | 2 | Allen Bradley |
| R24, 32 | EB 3015 | RESISTOR, 300 Ohm, 1/2 W, 5% | 1 | Allen Bradley |
| R21 | EB 3615 | RESISTOR, 360 Ohm, 1/2 W, 5% | 1 | Allen Bradley |
| R29 | EB 3615 | RESISTOR, 560 Ohm, 1/2 W, 5% | 3 | Allen Bradley |
| R26, 42, 45 | EB 1021 | RESISTOR, 1 K Ohm, 1/2 W, 10% | 2 | Allen Bradley |
| R23, 27 | EB 1125 | RESISTOR, 1.1 K Ohm, 1/2 W, 5% | 3 | Allen Bradley |
| R22, 34, 37 | EB 2025 | RESISTOR, 2 K Ohm, 1/2 W, 5% | 2 | Allen Bradley |
| R19, 25 | EB 2425 | RESISTOR, 2.4 K Ohm, 1/2 W, 5% | 1 | Allen Bradley |
| R15 | EB 3625 | RESISTOR, 3.6 K Ohm, 1/2 W, 5% | 6 | Allen Bradley |
| R35, 38, 46, 47, 48, 50 | EB 4721 | RESISTOR, 4.7 K Ohm, 1/2 W, 10% | 1 | Allen Bradley |
| R53 | EB 5125 | RESISTOR, 5.1 K Ohm, 1/2 W, 5% | 1 | Allen Bradley |
| R17 | EB 7525 | RESISTOR, 7.5 K Ohm, 1/2 W, 5% | 1 | Allen Bradley |
| R33 | EB 9125 | RESISTOR, 9.1 K Ohm, 1/2 W, 5% | 6 | Allen Bradley |
| R40, 41, 43, 44, 49, 51 | EB 1031 | RESISTOR, 10 K Ohm, 1/2 W, 10% | 2 | Allen Bradley |
| R36, 39 | EB 1531 | RESISTOR, 15 K Ohm, 1/2 W, 10% | 2 | Allen Bradley |
| R52, 54 | EB 2731 | RESISTOR, 27 K Ohm, 1/2 W, 10% | 1 | Allen Bradley |
| R14 | EB 1135 | RESISTOR, 11 K Ohm, 1/2 W, 5% | 1 | Allen Bradley |
| R20 | EB 1305 | RESISTOR, 13 Ohm, 1/2 W, 10% | 1 | Allen Bradley |
| R30 | EB 3005 | RESISTOR, 30 Ohm, 1/2 W, 5% | 1 | Bristol |
| K3 | C 1417-15 | CHOPPER | 1 | NLS |
| CR1 | 5003-003 | DIODE | 1 | Electron |
| C1 | XK2-682 | CAPACITOR, Polystyrene, .0068 Mfd, 200 VDCW | 1 | Electron |
| C2 | XL2-222 | CAPACITOR, Polystyrene, .0022 Mfd, 200 VDCW | 1 | Cornelco |
| R12 | 025-OL-1-20 | POTENTIOMETER, 20 Ohm | 1 | Cornelco |
| R10 | 025-OL-1-200 | POTENTIOMETER, 200 Ohm | 1 | Cornelco |
| R8 | 025-OL-1-2K | POTENTIOMETER, 2 K Ohm | 6 | NLS |
| R2-7 | PW1719B-15003M | RESISTOR, 1.5 Meg, 1/2 W, .05%, Aqua | 1 | NLS |
| R9 | PW1719B-89902M | RESISTOR, 899 K Ohm, 1/2 W, .05%, Orange | 1 | NLS |
| R11 | PW1719B-89901M | RESISTOR, 89.9 K Ohm, 1/2 W, .05%, Red | 1 | NLS |
| R13 | PW1719B-99910M | RESISTOR, 9.9911 K Ohm, 1/2 W, .05%, Brown | 1 | Allen Bradley |
| R1 | GB 1051 | RESISTOR, 1 Meg, 1W, 10% | 2 | NLS |
| K1, 2 | 5005-003 | RELAY | | |

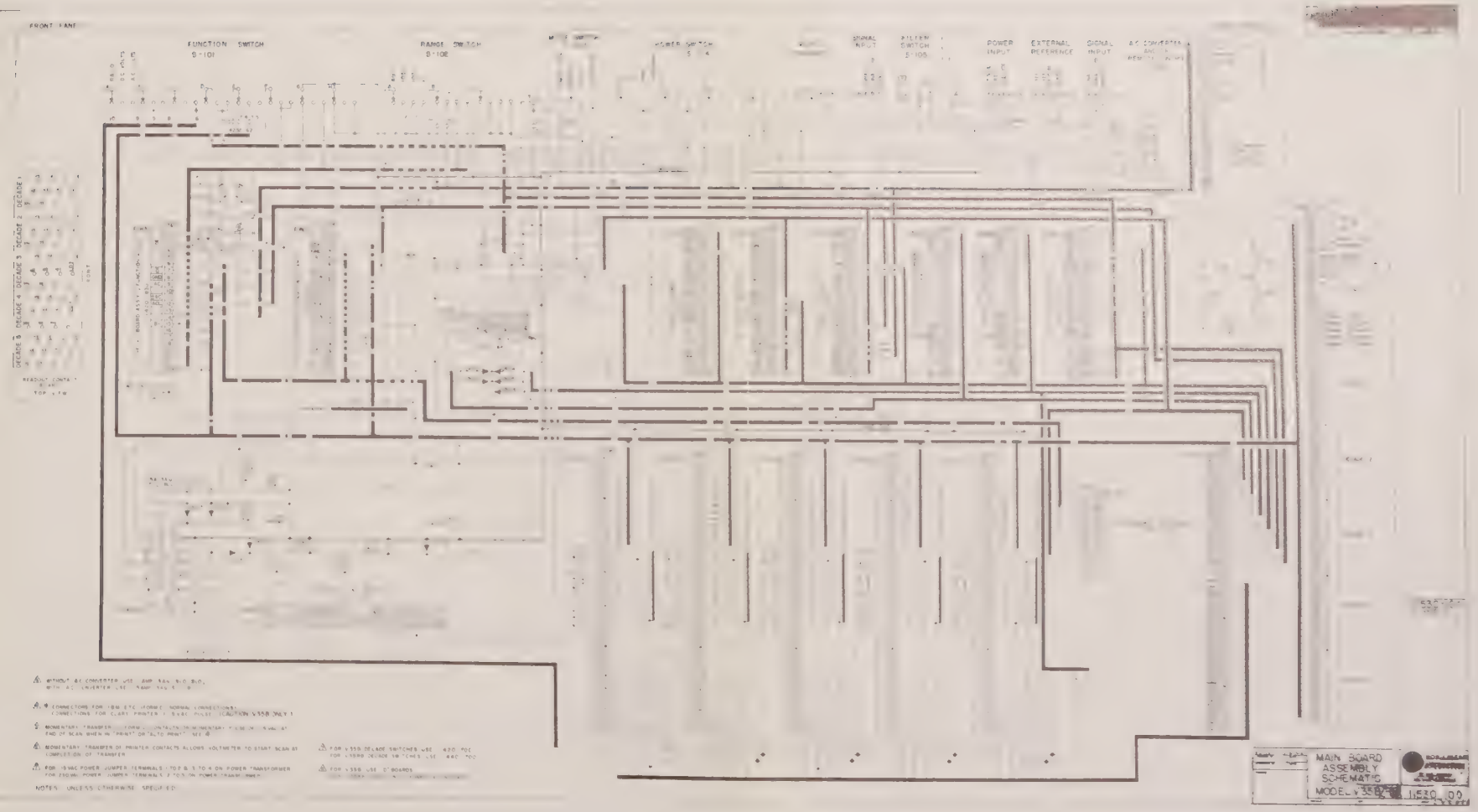


⚠ CERTAIN COMBINATIONS ARE SELECTED TO COMPENSATE FOR ZENER DIODE VOLTAGE (SEE MANUAL)

⚠ TP1 & TP2 ARE USED IN ADJUSTING THE ZENER REFERENCE

NOTES: UNLESS OTHERWISE SPECIFIED

NON LINEAR SYSTEMS, INC.


FRONT PANEL
FUNCTION SWITCH
S-101
RANGE SWITCH
S-102
NUMBER SWITCH
S-104
SIGNAL INPUT
FILTER SWITCH
S-105
POWER INPUT
EXTERNAL REFERENCE
SIGNAL INPUT
A-D CONVERTER
DECADE 5
DECADE 4
DECADE 3
DECADE 2
DECADE 1
READOUT CONTACT
TOP VIEW
NOTES: UNLESS OTHERWISE SPECIFIED
MAIN BOARD ASSEMBLY SCHEMATIC
MODEL V-350
11520 00

15004 125

REVISIONS

97 3106A 4S 2S 426

ADDED AMP 87-1 #465B

RED BANANA PIN) #465B

YELLOW BANANA PIN) #465B

COMMON (BLACK BANANA PIN) #465B

#20 BLACK STRANDED U.R.E.D.

INCLUDED WITH THIS CABLE

C2 SAFE T CLIP - RED

#332 A SPADE LUGS BIRNBACH

367 | 420 | 1420

H4-03626

APPLICATION

QTY REQD

UNLESS OTHERWISE SPECIFIED

DRAWN BY

MATERIAL

FINISH

TITLE

CABLE, EXTERNAL REFERENCE

NON-LINEAR SYSTEMS INC

DEL MAR AIRPORT

DEL MAR CALIFORNIA

DRAWING NUMBER

15004 125

SCALE

WT

SHEET

REVISIONS

| SYM | EFFECT | DESCRIPTION | DATE | APPROVAL |
|---|---|---|---|---|
| 1 | ALL | ADDED AMP 87-1 #465B & 221932 | 2-5-82 | J THOMSON |

SIGNAL HIGH (RED BANANA PIN) #465B

SIGNAL LOW (BLACK BANANA PIN) #465B

AMPL. GRD (BLUE BANANA PIN) #465B

BLACK VINYL SLEEVE VIDS 8/16 D. 025

INCLUDED WITH THIS CABLE

| | | | |
|---|---|---|---|
| 1 | 410 | C2 SAFE T CLIP BLACK | |
| 1 | 1410 | C2 SAFE T CLIP RED | |
| 4 | 332 | A SPADE LUGS BIRNBACH | |
| 1 | 3 | ALLIGATOR CLIP BIRNBACH | |

APPLICATION

QTY REQD

UNLESS OTHERWISE SPECIFIED

MATERIAL

NOTED

FINISH

TITLE

NON-LINEAR SYSTEMS INC

DEL MAR AIRPORT

DEL MAR CALIFORNIA

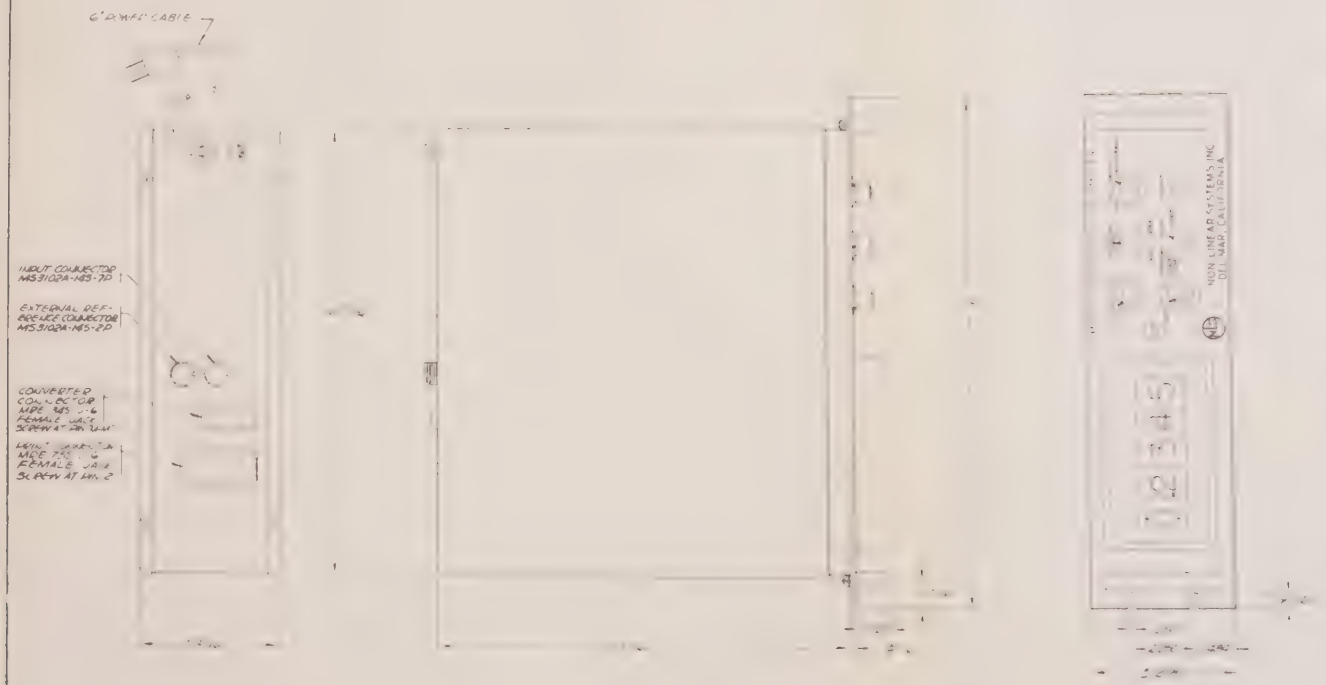
DRAWING NUMBER

15004-126

SCALE NONE

WT

SHEET


6' DIGIT CABLE
INPUT CONNECTOR MS3102A-14S-7P
EXTERNAL REFERENCE CONNECTOR MS3102A-14S-2P
CONVERTER CONNECTOR MIL-STD-1553 FEMALE JACK SCREW AT LVL 1
LEVEL CONVERTER MIL-STD-1553 FEMALE JACK SCREW AT LVL 2
NON LINEAR SYSTEMS INC
DEL MAR, CALIFORNIA

TYPE 7
CABINET

INPUT IMPEDANCE
INTERNAL REFERE

RESOLUTION 1 D 5IT
EXTERNAL REFERENCE VOLTAGE ± 10 TO
EXTERNAL REFERENCE INPUT IMPEDANCE
OPERATING POWER 115 230 VOLTS ±10%, 50-6
APPROXIMATELY 50 VOLT-AMPS

FEATURES
INDIVIDUAL PLUG-IN OIL BATH STEPPING SWITCHES
COMPLETELY TRANSISTORIZED
BALANCING TIME MAXIMUM: 2.36 SECONDS

SNAP IN READOUT

CONNECTIONS
SIGNAL INPUT CONNECTOR
A - INPUT
B - INPUT COMMON
C - CHASSIS OR LINE
EXTERNAL REFERENCE CONNECTOR
A - + REFERENCE
B - - REFERENCE
C - REFERENCE COMMON
D - CHASSIS GROUND

DIGITAL VOLTMETER
MODEL V35B
OUTLINE DRAWING

NON-LINEAR SYSTEMS INC.

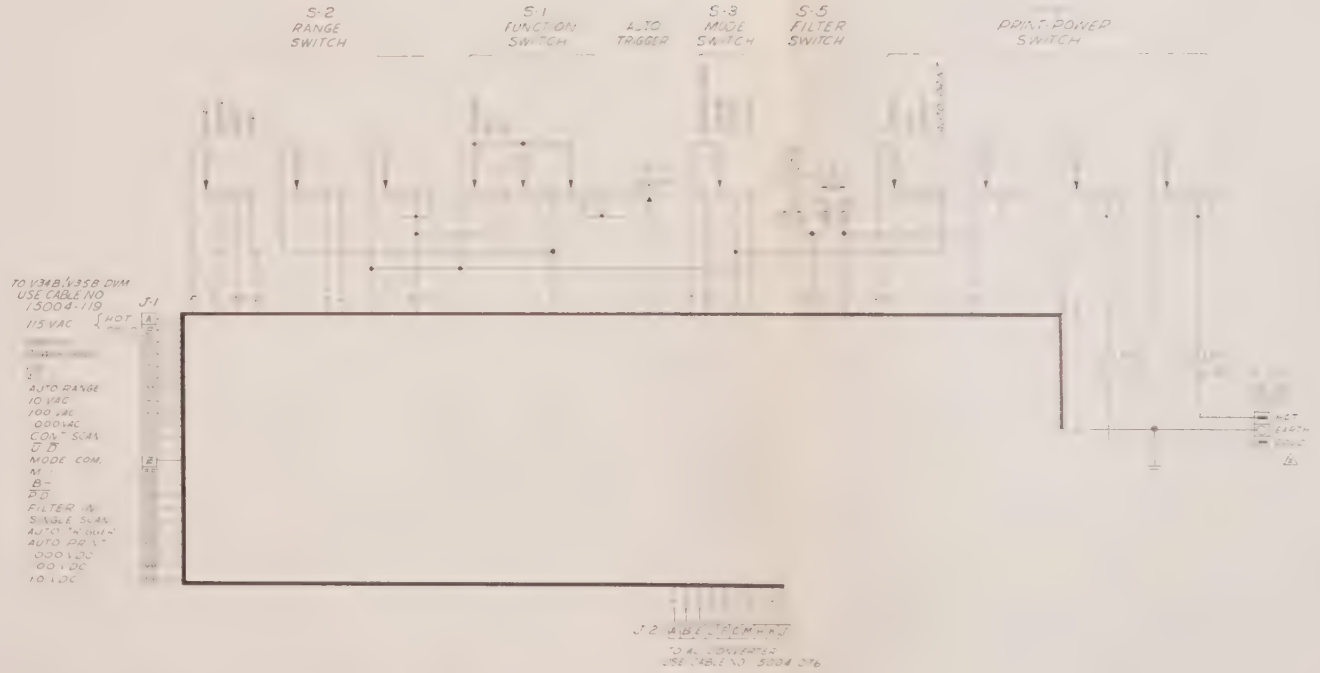
11530, Sheet 3 OUTLINE DRAWING





11530-100 MAIN BOARD, SEE ALSO PAGE 54

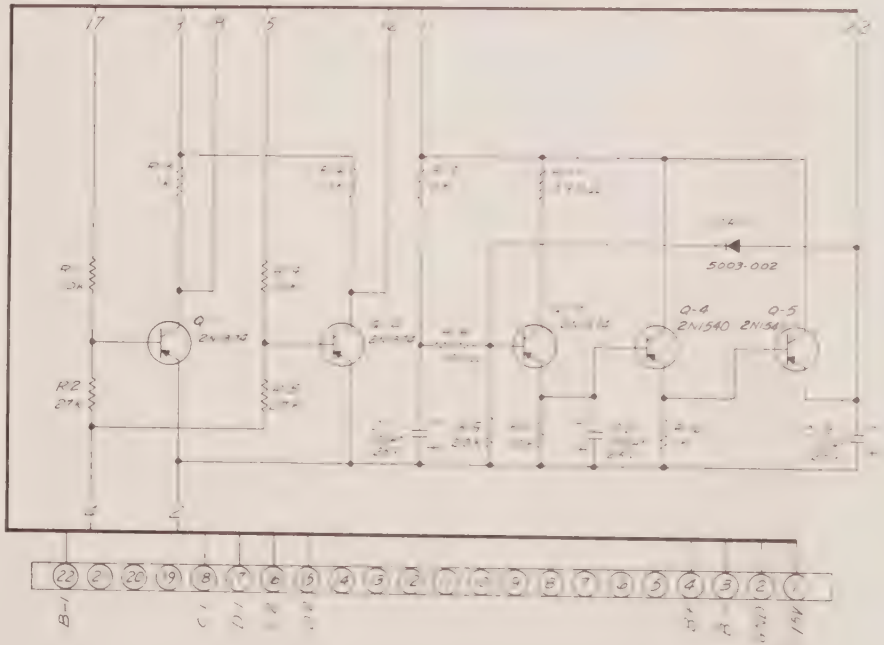
| CIRCUIT REFERENCE | PART NUMBER | DESCRIPTION | QTY PER UNIT | MANUFACTURER |
|---|---|---|---|---|
| L101 | 11400-108 | CHOKE | 1 | NLS |
| T101 | 11420-109 | TRANSFORMER, Power | 1 | NLS |
| CR109 | 3/4MB 2Z5 | DIODE, Zener ¾ W | 1 | Motorola |
| CR107, CR108 | 1N2616 | RECTIFIER | 2 | Motorola |
| CR105, CR106 | 1N1124R | RECTIFIER | 2 | T.I |
| CR112, CR116 | 5003-002 | DIODE | 5 | NLS |
| R101 | EB4721 | RESISTOR, 4.7K, ½ W, 10% | 1 | Allen Bradley |
| R108, R109, R110 | | RESISTOR, .6 Ohm, 5W, 1% | 3 | P.R.C |
| R111 | GB39G1 | RESISTOR, 3.9 Ohm, 1W, 10% | 1 | Allen Bradley |
| R112 | GB9101 | RESISTOR, 75 Ohm, 2W, 10% | 1 | Allen Bradley |
| C107 | ME2-105 | CAPACITOR, 1 Mfd., 200 VDCW | 1 | Electron |
| C102 | 5002-002 | CAPACITOR | 1 | NLS |
| C101 | 52RM25 | CAPACITOR, 25 Mfd., 25 VDCW | 1 | Ind. Cond. |
| C103, C106 | 1B1246A | CAPACITOR, 4000 Mfd., 25 VDCW | 2 | Ind. Cond. |
| C104, C105 | 1B1249 | CAPACITOR, 3X250 Mfd., 50 VDCW | 1 | Ind. Cond. |
| K101 | KRP-11D | RELAY | 1 | P.B. |




6. THIS UNIT IS AN ACCESSORY, NOT A PART OF THE V34B / 35B.
THIS JWO IS INCLUDED WITH THE V34B / 35B DVM'S ONLY IF ORDERED.
5. REMOTE CONTROL OF THE AUTO FUNCTION IS NOT AVAILABLE.
4. FOR REMOTE CONTROL, THE DVM SWITCHES MUST BE SET AS FOLLOWS:
AUTO TRIGGER TO MAX. RANGE TO AUTO, POWER TO OUT, F
3. FOR LOCAL CONTROL AT THE DVM, S1 THRU S4 MUST BE SE
⚠ PLUG POLARIZATION **MUST** BE OBSERVED.
⚠ FOR REMOTE CONTROL OF V34B / 35B, USE 3AG 1 5.0 B.O FUSE; FOR REMOTE CONTROL OF V34B/V35B **AND** THE .25 C OR .5 C CONVERTER, USE 3AG 2 5.0 B.O FUSE.
NOTES - UNLESS OTHERWISE SPECIFIED

SCHEMATIC, REMOTE CONTROL
V34B \ 35B
NON-LINEAR SYSTEMS, INC

REVISIONS

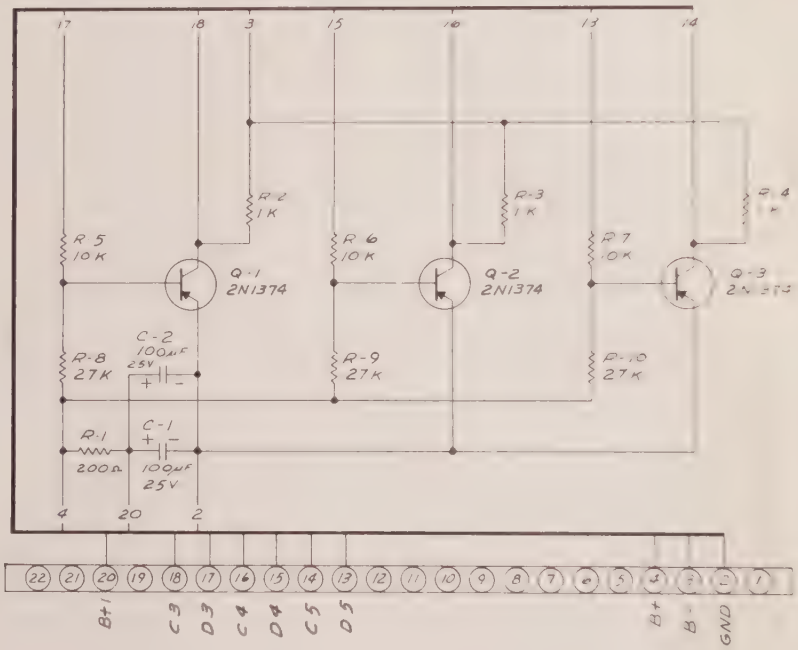



11440-500
SHEET 2

| APPLICATION | QTY REQD |
|---|---|
| | |

| | | |
|---|---|---|
| UNLESS OTHERWISE SPECIFIED TOLERANCES ON FRACTIONS ± DECIMAL ± ANGLES ± | CHECKED BY / DATE | SCHEMATIC "E" BOARD |
| MATERIAL | APPROVED BY / DATE | V34RB / V35RB |
| | FINISH | SIZE / SHEET 2 |

NON-LINEAR SYSTEMS INC.
DEL MAR AIRPORT
DEL MAR, CALIFORNIA
DRAWING NUMBER 11440-500




11440-550
SHEET 2

| NEXT ASSY | USED ON | NEXT ASSY | QTY REQD |
|---|---|---|---|
| APPLICATION | | | |

| | | | |
|---|---|---|---|
| MATERIAL | FINISH | SCALE | WT |

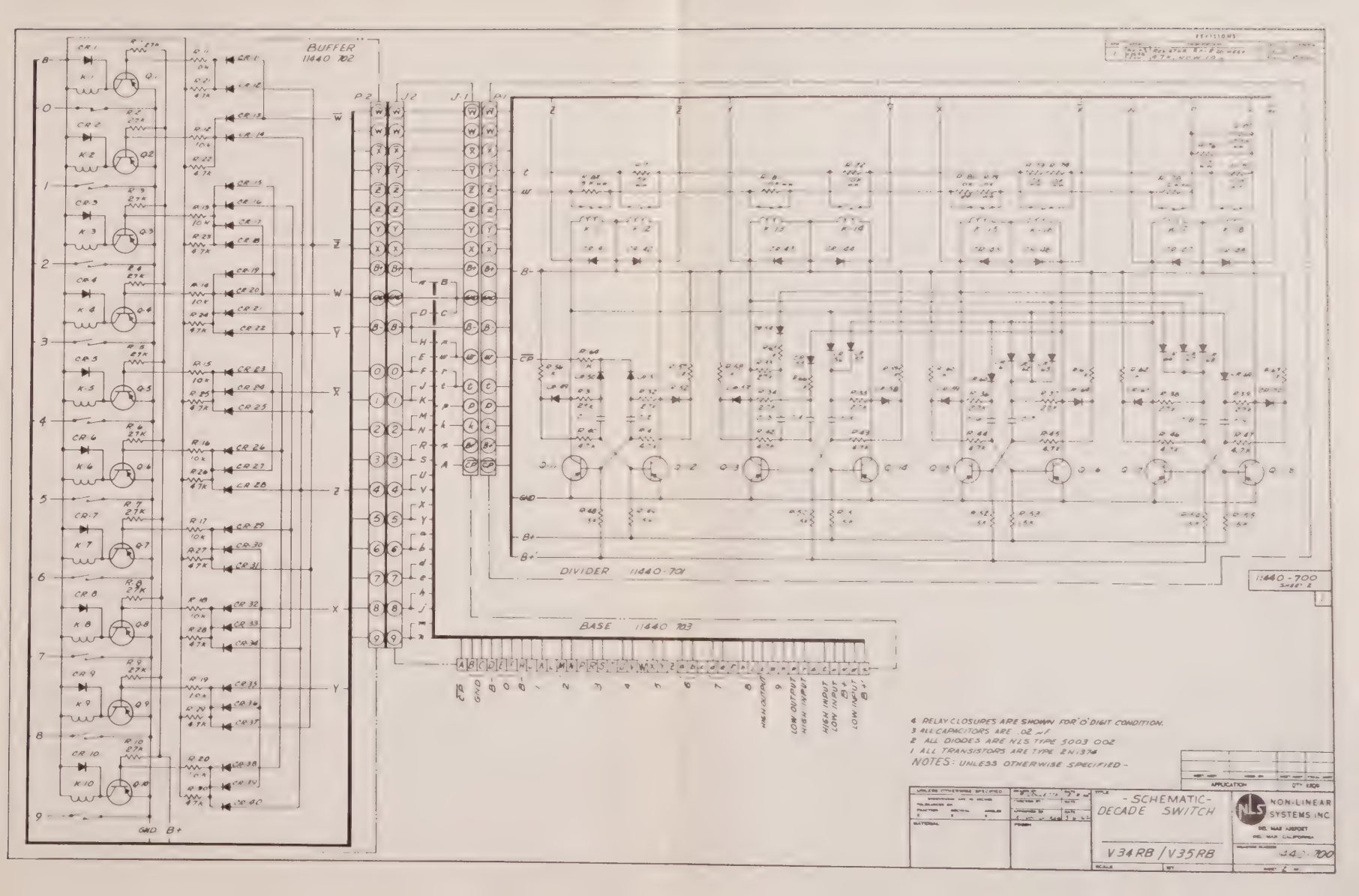
SCHEMATIC
"F" BOARD

V34RB/V35RB

NON-LINEAR SYSTEMS INC.
DEL MAR AIRPORT
DEL MAR CALIFORNIA

DRAWING NUMBER 11440-550

SHEET 2 OF


BUFFER
11440 702
DIVIDER 11440-701
BASE 11440 703
11440-700
SHEET 2
GND
B+
B+'
4. RELAY CLOSURES ARE SHOWN FOR '0' DIGIT CONDITION.
3. ALL CAPACITORS ARE .02 μF.
2. ALL DIODES ARE NLS TYPE 5003 002
1. ALL TRANSISTORS ARE TYPE 2N1374
NOTES: UNLESS OTHERWISE SPECIFIED -
- SCHEMATIC -
DECADE SWITCH
V34RB / V35RB
NON-LINEAR SYSTEMS INC
DEL MAR AIRPORT
DEL MAR CALIFORNIA
11440-700

# DIGITAL VOLTMETERS

## most complete line... by purpose... by price

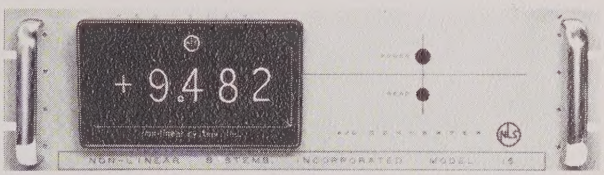
As originator of the DVM and leading manufacturer of precision digital measuring instruments, Non-Linear Systems, Inc., offers you the world's most complete line of DC and AC digital voltmeters, digital ratiometers, digital ohmmeters, and multipurpose instruments. Look to NLS for the instrument you need in the price range you desire. Only NLS provides the benefits of dealing with a company that's been in the DVM business for more than a decade — unmatched servicing follow-through, use-proven design superiority, and uncompromising instrument quality. Contact any of the 19 NLS sales and service offices for complete engineering information on standard instruments and custom instrumentation systems.

### INSTRUMENT SELECTION GUIDE

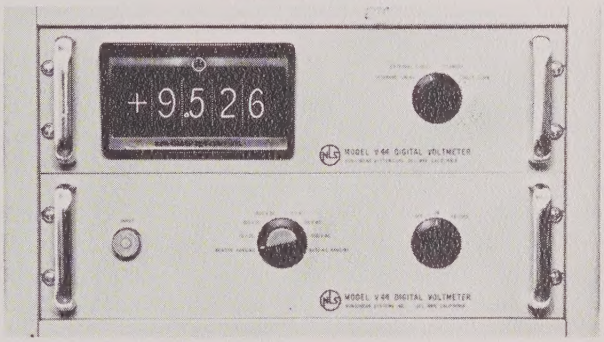
| To Measure | Model | Digits | Speed, Sec./Reading | Range | Type of Digital Output | Price |
|---|---|---|---|---|---|---|
| Volts, Ratio and Ohms | M25 | 5 | 1.1 constant | 100$\mu$v-1kv. .00001:1-99.999:1 .1$\Omega$-1 meg. | Decimal voltages | $5,985 |
| | M24 | 4 | .33 constant | 100$\mu$v-1kv. .0001:1-.9999:1 .1$\Omega$-1 meg. | Decimal voltages | $5,585 |
| Volts and Ratio | V35B | 5 | 2.3 max. | 100$\mu$v-1kv. .00001:1-.99999:1 | Decimal contacts | $3,985 |
| | V35RB | 5 | 2.3 max. | 100$\mu$v-1kv. .00001:1-.99999:1 | Decimal voltages | $3,385 |
| | 484A | 4 | 1 avg. | 1mv-1kv. 00.01%-99.99% | Decimal voltages | $1,460 |
| | RS2 | 4 | 1 avg. | 1mv-1kv. 00.01%-99.99% | Internal printer | $3,635 |
| Volts | 15 | 4 | $67x10^{-6}$ constant | 100$\mu$v-100v. | B-C-D or binary volts | $4,985-$5,485 |
| | V44 | 4 | $5x10^{-3}$ constant | 1mv-1kv. | Decimal & B-C-D volts | $6,185 |
| | CH2 | 4 | $1x10^{-2}$ approx. | 1mv-1kv. | Decimal & B-C-D volts | $6,585 |
| | V64B | 4 | 0.75 avg. | 1mv-9.999v. special to 1kv. | None | $885 |
| Voltage Ratio | R65A | 5 | 1.5 avg. | 00.001%-99.999% | None | $2,135 |
| | R65B | 5 | 1.5 avg. | 00.001%-99.999% | Decimal voltages | $2,335 |
| Millivolts | V60 | 4 | 1.5 avg. | 10$\mu$v-99.99mv. | None | $1,660 |
| | V60A | 4 | 1.5 avg. | 10$\mu$v-99.99mv. | Decimal voltages | $1,960 |
| Ohms Deviation | DO24 | 4 | .33 constant | 00.01%-99.99% | Decimal voltages | $5,585 |
| Ohms | 784 | 4 | 1 avg. | .1$\Omega$-10 meg. | Decimal voltages | $1,460 |
| Digital-Analog | 16 | 4 | $4x10^{-6}$ constant | .001v.-9.999v. | | $3,085 |
| AC, Low-Level DC, Data Logging, Go/No-Go Testing | Plug-in accessories are available for high accuracy measurement of AC and low-level DC, data logging, and go/no-go testing. Also, NLS offers a wide range of custom instrumentation for special applications. | | | | | |

Prices and specifications are subject to change without notice. Prices F.O.B. destination U.S.A.

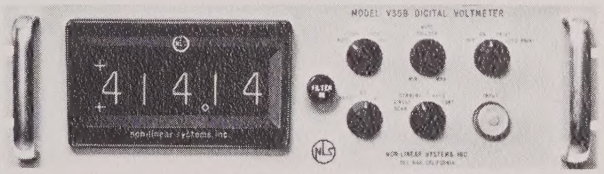
Accuracy is $\pm$0.01% of reading $\pm$1 digit except for millivoltmeters which have accuracy of $\pm$0.1% of reading $\pm$1 digit (precision is $\pm$1 digit). V35B-V35RB ratio accuracy is $\pm$0.005% of reading or $\pm$1 digit. Input impedance is generally 10 megs for voltage measurements, 1,000 megs for ratio (10 megs on M25's two highest ratio ranges). Input impedance of Models 15 and 15B is 625 ohms/volt. Decimal digital outputs are 10 lines/decade.




High-Speed A/D Converters



Five-Digit and 4-Digit Instruments that measure Volts, Ratio and Ohms




Five-Digit and 4-Digit medium-priced Voltmeter-Ratiometers

Low-cost Industrial DVMs and Ohmmeters

*Originator of the Digital Voltmeter*

**non-linear systems, inc.**

Del Mar, California

non | linear

systems, inc.

DEL MAR, CALIFORNIA

www.manualsplus.com

1022565